W. H. Ochsner
235 Emerson St.
Palo Alto.
California.

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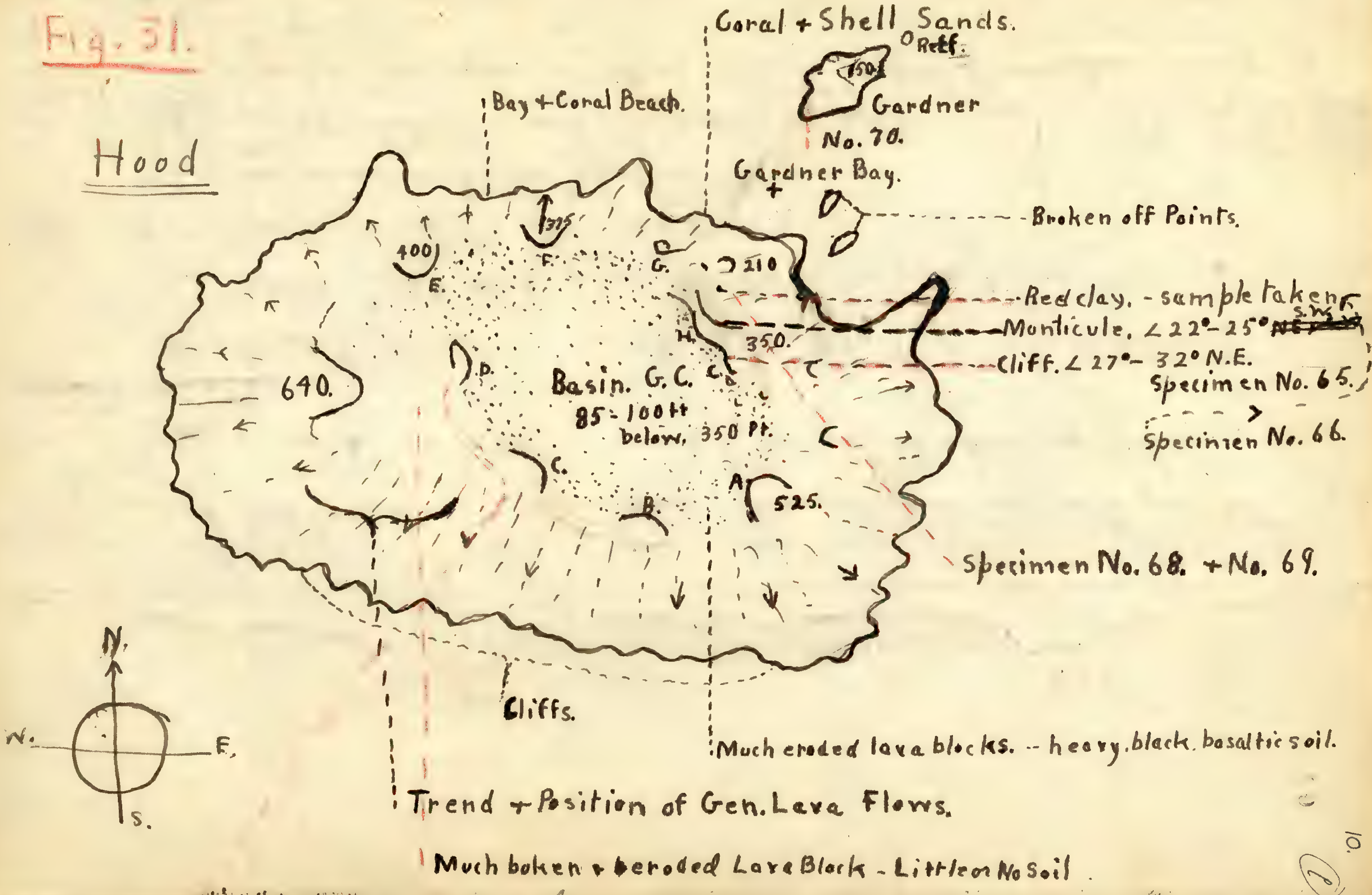
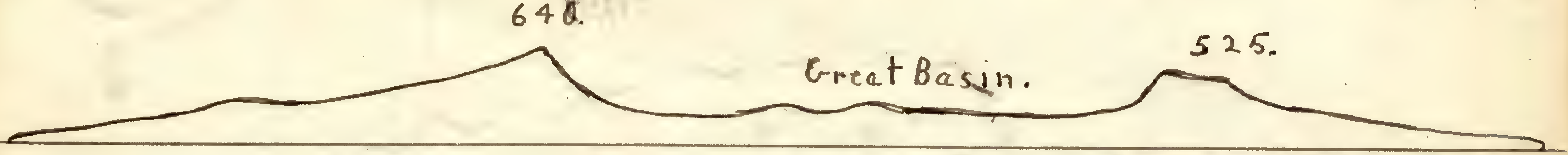
Fig. 51.

Hood


Coral + Shell Sands.
Reef.
150.
Gardner
No. 70.
Gardner Bay.
Broken off Points.
Bay + Coral Beach.
Red clay. - sample taken.
Monticule. ∠ 22° - 25° S.W.
Cliff. ∠ 27° - 32° N.E.
Specimen No. 65.
Specimen No. 66.
Specimen No. 68. + No. 69.
375
400
210
350.
640.
525.
E.
F.
G.
H.
D.
C.
B.
A.
Basin. G.C.
85 - 100 ft
below. 350 ft.
Cliffs.
Much eroded lava blocks. -- heavy. black. basaltic soil.
Trend + Position of Gen. Lava Flows.
Much boken + eroded Lava Block - Little or No Soil
N.
E.
S.
W.

D. "C" & "B" are very low. -

Fig. 32



Hood island in outline. Drawn from slips at about 6 miles. S.S.W. This view shows the: ~~great crater~~

1. Great Crater which takes up the whole interior.

2. General E.S.E and W.N.W trend of island ~~a~~ as measured along it's longest axis.

3. General slope of flow.

4. Small interior eminences appearing in Fig. 31. as "B." "C." "D" et. which mark the margin of the last active ~~crater~~ part of the great crater.

Fig. 31 shows the general surface features of Hood.

"A" "B" "C" "D" etc. are rocky points rising above the surrounding levels ~~to~~ a height of 50 – 150 ft. Facing the "Great Basin" each presents a steep rocky cliff:- on their outward sides the heights slope on a gradual angle to the ~~the~~ coast. The character of these eminences will be shown in photo No. 2. of Hood. ~~taken~~ (Mr. Beale). Taken at the top of 350 elevation.

"Basin G.C." is a low. circular. black-soiled depression dotted with numerous loose ~~rock~~ smoothly eroded lava blocks. The lava blocks become more numerous near the margin & the marginal promontories, as indicated by the dotted area.

Elevation "H", is peculiar in that it forms a wall between the large crater & the smaller monticular one in the E & N. E. The top of this wall is not more than 125 ft. wide. The directly opposite & large L.S. of cliffs are notable. Also the difference in the soil on the two opposite sides.

No doubt the great "basin" - marked "Great Crater". is the depression marking the old crater. The outer limits of the crater are marked by the higher promontories - such as 640 ft. 525, 350 etc. This idea is further proven correct by the outline fig. No. 32.

Now that it is shown that this is the great crater. where is the immense amount of exuded lava which must have arisen from this great crater? Where are the many monticular vents which mark the other great craters of these islands?

The answer to this is subsidance!

Abundant evidence of a ~~profound~~ subsidance is shown in Gardner Island - the small outlying points and the cliffs on the south.

Hood is one of the oldest - (volcanic activity dead the longest) of the Islands. When the subsidance came it carried much of the outlying territory under the ocean then there was no active monticular vents to rebuild & extend the remaining territory

Geology of the Galapagos Islands.

Hood Island

ep. 25-29. In the language of the Blue Book - the island is "round, rough & rugged". During the past days work inland I have attempted to follow out the details of the geology. It has been difficult for it seems one mass of lava under different stages of break down. Working inland one ~~walks~~ ascends a gradual slope to a general altitude of 300 to 375 ft. - ~~approaching~~ ~~from~~ from the anchorage in Gardner Bay the elevation reached is a plateau at at about 225 ft. alt. where it forms a sort of depression having a drainage from the four or five peak like rocks which form the margin. To the westward of this basin ~~is~~ a gradual rise to the highest point (c 40 ft) In general. from these high elevations there are rocky ridges, probably the direction of lava flowage. None of the peaks or elevations show any indication of old volcanic cones. The whole surface of the island - ridges, peaks & all - is made of the dark compact lava. ~~Have to Das~~ This rock is heavy, close grained ~~of~~ & of an even texture - except on the low limit of the ~~coast~~ coastal plane, where a pronounced bubble structure is seen. As yet no specimens were taken from Hood. but will be & be described then.

Sep. 28.

I worked on Gardner Island & obtained some rock specimens which will be described at the time of labeling.

The general surface appearance of Gardner resembles Hood. ~~Wh~~ While working at low tide, however, on Gardner I observed quite a difference; the whole underlying structure of the island is a light, extremely tufaceous rock, of a red color, ~~&~~ & leaving jagged edges on the line of coastal erosion. This structure as a basic foundation is different from Hood where no such formation is noticeable at the coastal line of erosion. From what I can see of the outstanding rocks adjacent to Hood. this red rock is in evidence. I do not now know its significance. It may be that Gardner is a little more recent. & came at the close of the volcanic activity

Sep. 30.

Work to the northward along that shore of Hood. Find the "sub-stratum" foundation of the island. It is a dark, partly scoriaceous tufa. In weight much like basalt. The angle of slope is very gradual - almost a level platform. Specimens will be taken from this & described. On a large ~~dus~~ promontory of the island, the most northern point, I noticed a small outcrop of the red lava formation, cited on Gardner.

All the surface lava has a strong metallic click & ring when stepped on or struck a brisk blow with a hard implement. Made a perfect dinner gong with my geology hammer on one.

Geological Note

Dana p. 978 - a reference is made to a probable cause of the glacial epoch - & makes some reference to what a deep subsidence of the isthmus of Panama would mean. May have an important relation to the history &

derivation of the animal life.
(a note worthy some thought)

Geol. Note.

Dana p. 20 & seq. Read the whole argument. & the double page map is exceedingly valuable in illustrating the probable plateau upon which the Galapagos are situated.

The sand beaches of Hood & Gardner are almost pure coral sand. & would have some economic value — investigate further. Take specimens of the sand at earliest opportunity.

Oct. 3.
Landed on Gardner & Champion Islands. Both of recent volcanic nature. Rough, sharp, a little loose sandy soil. Craters at the summit of each island. No specimens taken because of the loose, extremely scoriaceous nature of the ~~soil~~ excreta.

Oct. 4. Go ashore in P. O. Bay. North S. The high bluffs (appearances) as seen from the sea prove to be old volcanic craters. First one near the Bay is 180 ft. high. Second one ascended is 675. The crater is well defined & its nature can not be mistaken. In general the land is quite accessible for walking due to the abundant break down of volcanic rocks to form a sort of sandy soil, not unlike some silica sand. The beach sands are of this material instead of the coral of Hood. Where the water of the rainy season has made cuts through the surface sand, the black, porous, volcanic rocks is seen forming the foundation of the whole. At the beach this sub-layer of ~~the~~ lava outcrops in horizontal lines of flowage. In some places the rectangular blocks formed by the cracking of the lava during cooling gives the appearance of basaltic columns.

The island looks like one of the old ones in the group, judging from the amt. of soil & the complete

19. extinct appearance of the craters.

Oct. 5.

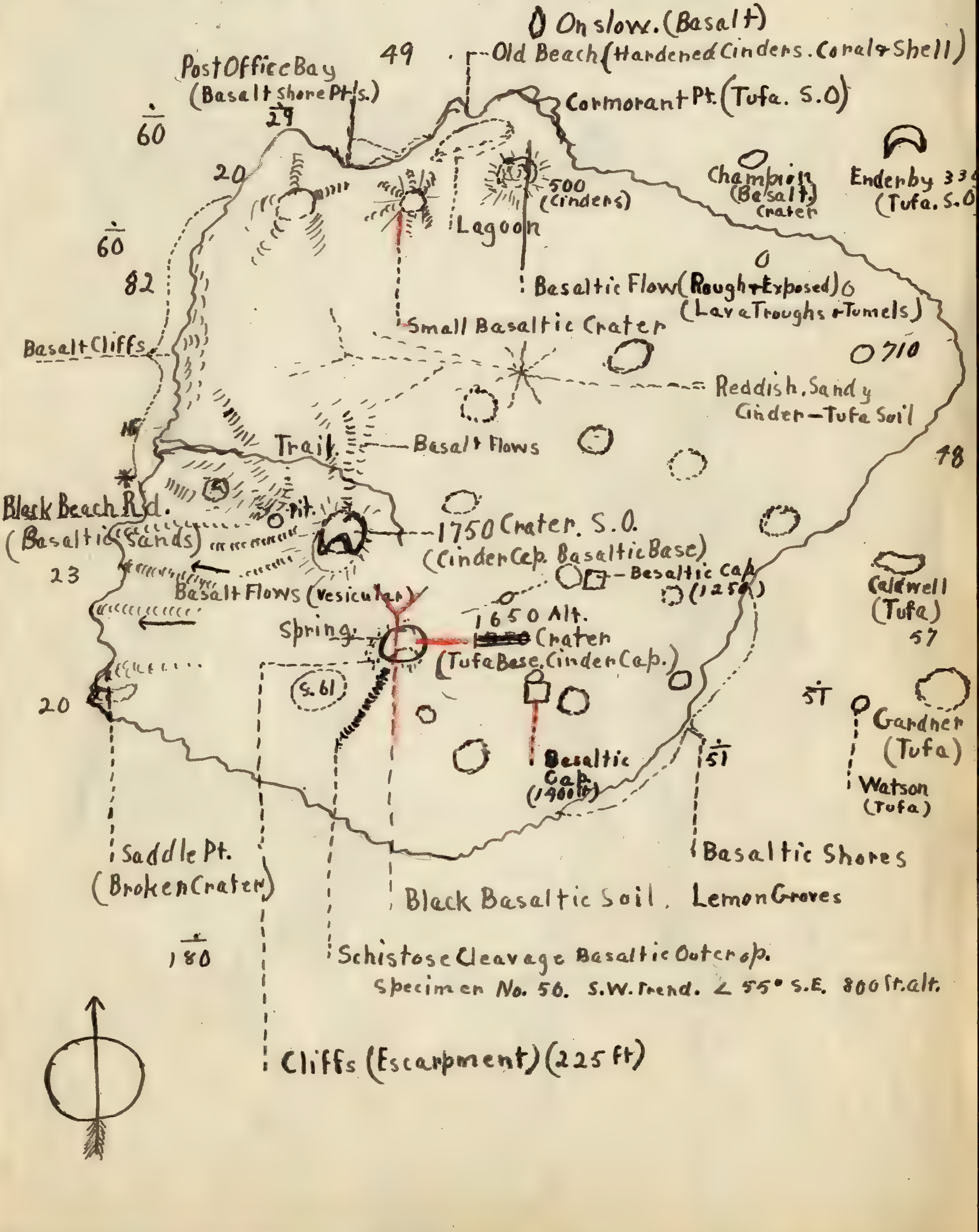
Go ashore in Cormorant Bay - visit the flamingo lagoon. Rather an interesting feature. It is a long, shallow, pond. Perhaps ~~the~~ $\frac{3}{4}$ of a mile in length by $\frac{1}{4}$ wide. The bottom is a solid bed of lava, covered by a thin (3 or 4 ft.) layer of mud. It lies some 10 & 20 rods from the coast. The water ~~is about~~ varies from a few inches to 18 inches deep. When one walks in in the water & stirs up the muck a strong smell of sulphur pervades the air, ~~tickles the thr~~ so strong it tickles the throat & air passages. The pond must have some subterranian passage, for with the ~~at~~ rise & fall of the tide there is a variation in the depth of the water. Just back (S.) of the pond is a high volcanic cone, from which ~~the~~ trend of lava flow can easily be traced. Along the shore too, ~~the sides are~~ there is a gradual slope of the lava fields toward a general centre - the lagoon.

Oct. 6.

Observe that the lagoon is ~~fo~~ made possible by a small sand dune on the N. sea face, ~~on~~ the south E. ~~side is~~ bank is formed by a large sand dune, which fills the gap between two large volcanic cones & their lava flows.

Charles Island

Fig. 28.


Onslow. (Basalt)
Old Beach (Hardened Cinders. Coral & Shell)
Post Office Bay (Basalt shore Pts.)
49
29
60
Cormorant Pt. (Tufa. S.O)
20
500 (Cinders)
Lagoon
Champion (Basalt) Crater
Enderby 33
(Tufa. S.O
60
82
Basaltic Flow (Rough & Exposed) (Lava Troughs & Tunnels)
Small Basaltic Crater
710
Basalt Cliffs
Reddish, Sandy Cinder-Tufa Soil
Trail
Basalt Flows
48
Black Beach Rd. (Basaltic Sands)
Pit.
1750 Crater. S.O. (Cinder Cap. Basaltic Base)
23
Basaltic Cap (1250)
Basalt Flows (vesicular)
Caldwell (Tufa)
57
Spring
1650 Alt. Crater (Tufa Base, Cinder Cap.)
S. 61
20
5T
Gardner (Tufa)
Basaltic Cap (1900 ft)
51
Watson (Tufa)
Saddle Pt. (Broken Crater)
Basaltic Shores
Black Basaltic Soil. Lemon Groves
180
Schistose Cleavage Basaltic Outcrop.
Specimen No. 56. S.W. Trend. ∠ 55° S.E. 800 ft. alt.
Cliffs (Escarpment) (225 ft)

Charles

Fig. 28. showing the surface features of Charles is self explanitory. & to sum up is important in the following points:-

1. Evident ~~N.-S.~~ S-N trend of the volcanic activity the S. & S.E. exposures & half of the island are well broken down to form a pitch black basaltic soil & covered with a thick growth of native and imported trees & bushes, while the N. end of the island presents much still unbroken lava flows. Especially is the N. end the scene of more recent activity about the salt lagoons & two craters to the W.

2. General S. & S.E. breakdown of the rims of the craters.

3. Basaltic flows forming the general basis of the island as exposed at all the shores & in exposed surface flows near the W. coast.

4. The *important fact* that the large Spring Mt. has a tufa base with a cinder-mud composition for its great cap. This is the first crater, of any size, *situated* inland, which shows a tufa *structure*: thus far the only tufa formations have been those small outstanding rocks, islands, and projecting island points. Thus far it has been assumed that *only* the tufa formations are the *true* evidences of oceanic formations.

This formation on Charles must tend to further investigation into the cause of tufa formation. It may be also that this particular mountain will come under some exceptional case or possibility. (Rain fall)

5. The high cliffs on the W. margin of Spring mt., exposing the formation of the mt. & extending N. to the Spring, where it was photographed) indicates a subsidance in the W. & S. W. direction.

6. subsidance trend strengthened by the lava outcrops ~~at~~ in S.W. direction.

7. Nearly all outstanding islands are of tufa structure.

8. All basalt of the lower elevations, (notably that to the W. of 1750 crater) are highly vesicular, bubble like, perhaps a formation under & with water.

The two basaltic caps to E. & N.E. of Spring mt. are both above 1200 ft. alt. indicating that to be the first height above water at the time of insular formation.

Yet no real evidence of elevation.

N. W. end
1750
I
1650
II
S. E. end
III

Fig. 30.

General outline map of Charles from the W. just off Black Beach Road. Illustrates the structural arrangement of a cluster of volcanic cones & their relative N. & S. position; the angle of slope etc.

N.W. end & S.E. end illustrate the S.E x N.W. extension, that being the longest dimension – nearly N. X S.

The chart showing the surface features (topographic) did not take in quite all of the details. - especially the great number of craters. From the top of the 1750 ft. elevation I counted no less than 48 craters & cones large & small. in various stages of break-down. The total number of cones probably exceeds this count by perhaps 8 or 10.

The craters were so grouped that it seemed difficult to determine the trend, but taking the highest points as an axis the trend ~~seemed~~ was determined about

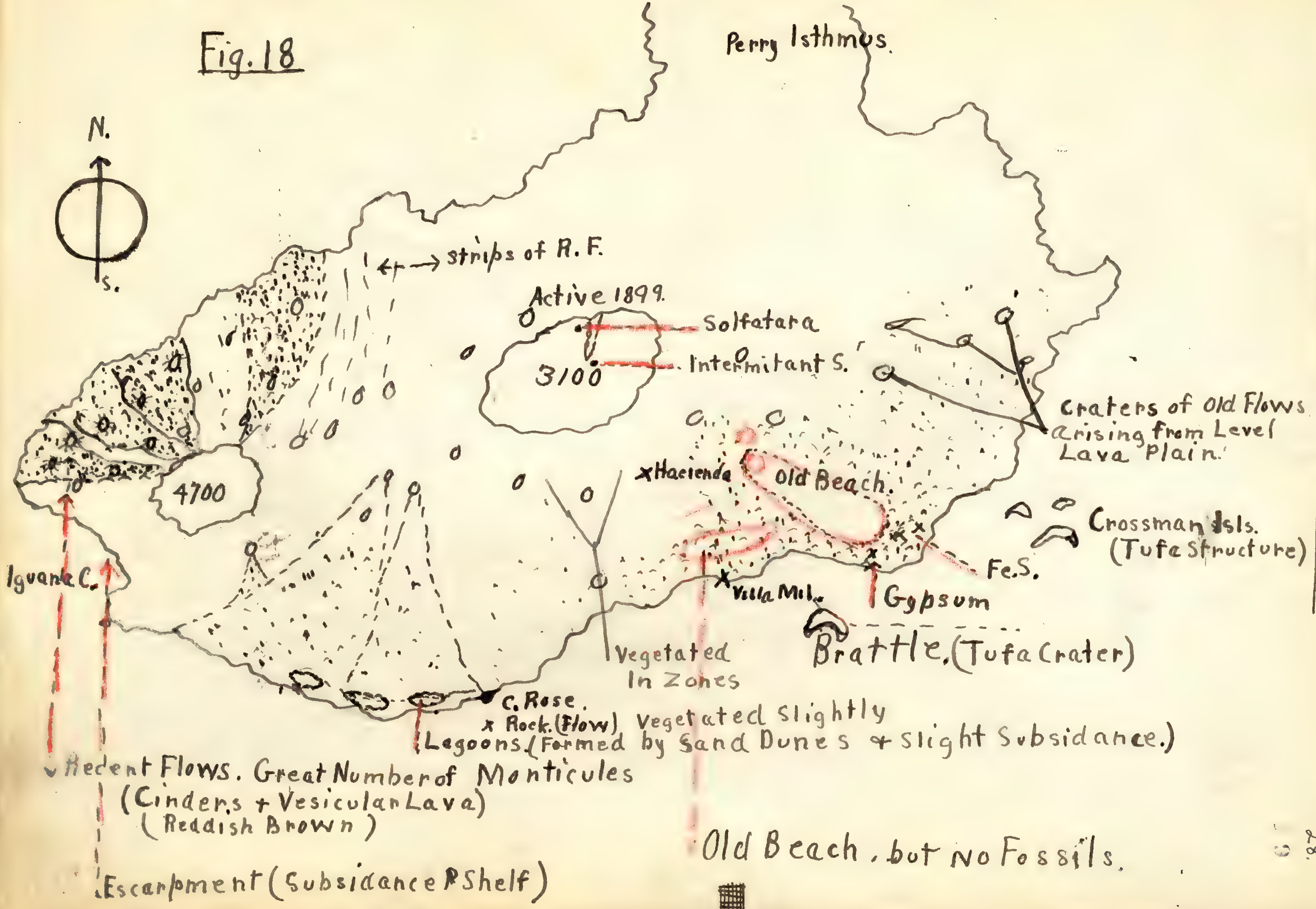
N.xW. & S.xE. :

Charles.

Fig. 29 General outline view of Charles from the N., about N.N.W.: Shows the general angle of slope, the relative heights & their location; & illustrating the general assemblage of old craters & crater cones.

Albemarle

Fig. 18



N.
S.
Perry Isthmus.
←→ strips of R. F.
Active 1899.
Solfatara
Intermitant S.
3100
4700
Craters of Old Flows arising from Level Lava Plain.
xHacienda
Old Beach.
Crossman Isls. (Tufa Structure)
Fe.S.
Gypsum
Villa Mil.
Brattle. (Tufa Crater)
Vegetated In Zones
C. Rose.
x Rock. (Flow) Vegetated Slightly
Lagoons. (Formed by Sand Dunes + Slight Subsidance.)
Iguana C.
Recent Flows. Great Number of Monticules (Cinders + Vesicular Lava) (Reddish Brown)
Escarpment (Subsidance Shelf)
Old Beach, but No Fossils.

Alebemarle Island.

Nov. 1, 1905. - Turtle Cove. -

From the anchorage looking inland, for miles, the region is a great lava plain. The lava is the black, vesicular, heavy form. The direction of the flowage is well marked by the corrugated surface. In general its lines of flowage is like the form taken by thick tar. The lava field is much broken by great deep cracks caused by the cooling. In some places the cracks have splintered the flow laterally in thin sheets, which may again be cracked along the vertical axis to form blocks resembling those of basalt. The shores of this region are much broken caused by flow of lava into the ~~sea~~ territory now held by the sea. P— Along the shores between this coast & Brattle island, & in the bays & lagoons ~~observed~~ investigated it was ~~see~~ observed that the shores sloped off gradually in ~~layers~~ shelf upon shelf of the same black lava. At the beach line, nor in the rocks exposed at low tide was there any marked difference in the lava indicating the meeting point between a lava flow & the ocean. These last two observations would indicate an area of subsidance

(Whether there is a diff. in texture of fresh lava after meeting the sea should be investigated - say at James)

A most important discovery is that of a probable deposit of asphaltum. Mr. Beck returned from the settlement one day with a small piece of a black resinous rock much like a variety of asphaltum. He was told by the man who gave it him that the natives use the material for burning purposes. The exact location ~~of the~~ and the manner of accurrence of this material, but an effort must be made. Its presence would go far in determining the value of the theory of subsidance.

Several good specimens (were obtained) of the great deposits of native sulphur & they were given me by the natives employed by me Anton Jill. ~~The~~ Part of their activities here is the collection of large quantities of the sulphur to be exported to Guayaquil. Mr. White & Mr. Beels who have visited the region of its occurrence say that there are thousands of tons of this ~~[illegible]~~ mineral in an old volcanic crater - the one at the summit of the island.

Its economic importance must be further investigated.

Nov. 3.

To day I was handed a small specimen of a rock which looks much like ~~Mica~~ Gypsum. Perhaps Gypsum or Vermiculite - the product of altered mica. Was told that it existed in "bastante" quantities and that I would be shown the location.

The occurrence of this is interesting & may prove to be very important.

This page was misnumbered. It has been moved to the back as part of the "Occasional Ideas" section, the last in the notebook.

The continuity from page 33 to 36 is fine.

Barbara West
8 Sept 2003

Maybe
35 34
[26] [25]
. Christina Fisher
2/17/2011

- These Occasional Ideas were moved to the back before written number 88, stamped number 79.

Albemarle.

Villa Mil.

March. 5, 1906.

On this date a rather important discovery was made. Going about N. by E. from the settlement, we crossed an almost level plane of recent lava. The flow was so even & unbroken that walking is excellent. At a distance of about 1¼ miles in the direction given, a long thinly vegetated area lies at right angles to the direction taken. This area ~~stands~~ with its few green bushes stands out sharply in contrast to the ~~lava~~ barren lava fields.

~~Actual~~ Inspection of the this vegetated territory shows it to ~~be~~ a ~~long~~ gently undulating plane whose soil is entirely of a white shell sand, such as forms the sand beaches of the islands everywhere. One's attention is soon attracted to the number of marine shells lying loose on the surface of the ground. The whole territory is soon ascertained to be an old weathered beach whose fossil members have become loosened from the easily broken sand matrix by the eroding agencies of even this ~~[illegible]~~ dry zone.

A number of the loose specimens were collected. ~~The~~ In one place a sort of upturned ledge of sand rocks was exposed. A number of specimens were broken out of the matrix.

All the specimens taken were in good condition. Though there were only a few species obtained for the most part they illustrate a life not now there.

The extent & general size of the deposit must be determined & mapped after future investigations.

Secured two specimens of a white lime like thin ~~incrusta~~ a layer of rocks. formed probably as ~~an~~ lime incrustation over the old beach. The ~~rock layer~~ shale-like layer was at the surface of the soil, ~~existed~~ only slightly covered by the loose wind-blown sand. Another specimen, much resembling the two just described but darker in color was handed me by one of the natives who probably took it from the deposit neighborhood.

Took some good specimens of FeS. In some places the lava flow had been thrown in heaps & somewhat weathered out allowing the sulphide to appear as a glittering powder.

Secured a few pieces of a sort of resinous matter which occurs in little rounded globules on & near the broken parts of the old lava flow.

Albemarle.

March. 8–10. 1906

A memorable visit to the great crater & the active solfatara.

On the chart the somewhat circular area labeled 3750 ft. alt. is a fairly good diagram of the great crater which forms this S. & S.E. end of the island. The total distance from the coast figured in a direct line to the crater is approximately 20 miles. (Fig. also on chart) The first 3 to 4 miles is almost level lava fields, probably no greater angle than 5–7°. From this dist. however the slope is more decided but gradual still. Probably 10–14° is the general rise, which remains constant up to the rim of the crater.

The rim of the great crater is perfect – one unbroken circle. Inside the rim drops off abruptly at ~~72–75°~~ 68–70° to the great almost level floor of the crater, averaging nearly 800 ft. below. My barometer measure for alt. of rim was 3100 ft. (Take diam. of crater from chart. Secure picture)

From the N.W. side of the rim & extending in a S.E. direction is a sort of peninsula composed of lava. Its point of juncture with the rim. its height is nearly equal to that of the rim. From this point the peninsula extends in the direction named & indicated (To be drawn on chart.) until it reaches about 1/5 the distance across the crater, ~~about~~ which point it reaches after ~~gradually~~ a gradual decline. Near the apex of the angle formed by the peninsula & the rim, the vapors from the active solfataras rise like smoke.

The active area comprises about ~~3~~ 2 acres. & consists of three distinctly spouting areas. with a large number of small vents. The largest of the vents ~~has~~ is a somewhat circular opening some 5 ft. in diam. Its sides are built up ~~abt~~ ~~from 6–8 ft. above to form~~ ~~[illegible]~~ of a deposit of pure sulphur to form a sort of chimney some 6–8 ft. tall. ~~The~~ Out of the opening there poured a continual stream of thick, sulphur vapor, which ~~almost~~ choked me with its strong fumes. Out of this ~~ga~~ spouting chimney there came a continuous roar. seeming to ~~[illegible]~~ have its origin at great depths. and in sound not unlike the sullen roar of a champing

Albemarle

a railroad engine under the roof of a covered station. For some distance from its base upward, the chimney like deposit consisted of solid sulphur but on its newly formed surface ~~layers~~ deposits the sulphur was ~~thin~~ like powder, yielding easily to a blow of a thermom stave.

About 50 ft. in elevation above the large vent just described was a large area approximately 18 rds. square, in which a number of small spouting, vaporizing holes ~~from~~ were busily at work steaming away, emitting the strong sulphurous vapor. At these small vents, so closely approachable, there were beautiful examples of the deposition of sulphur. As the sulphur laden vapor came to the surface it was condensed allowing the sulphur to ~~fall~~ be deposited. The atomic force & the tendency to crystalize brings the light masses together to form a solid encrustation. Each little vent has built up its own chimney, which as deposition continued & the force of vaporization diminished, was completely closed at its top leaving only a little mound to mark the location of the former vent. Some of these little mounds when broken open with a hammer began steaming away in earnest, & with such force that when little particles of sulphur were thrown into the opening they were immediately toss back & whirled much after the manner of the bright pieces of coke in the blacksmith's forge.

These small vents gave the most beautiful illustrations of sulphur crystalization. After the first deposition of the massive, closely constructed part of the chimney and the force & extent of vaporization decreased, the crystals in formation were not interfered with by the action of the weather or the swiftly moving vapor. Thus ~~they~~ atoms were undisturbed to build their largest & most beautiful crystals forms. The largest crystals were about 3 - 4 m.m. in length by 1½ across the horizontal axis. Their undisturbed formation allowed them to build one upon the other until long filaments nearly two inches in length were built up. The most favorable condition for this structure ~~was~~ is the horizontal cave like trend of the chimney, produced by some obstructing blocks of lava causing the vapor to shoot off in a somewhat horizontal direction. On the under side of the roof of such a cave formation the beautiful, delicate, crystal filaments hung pendant after the manner of stalactites.

But the finest & most delicate specimen of crystalization was observed in a miniature chimney about 8 inches tall. After the first thin crust structure had been built the condensing vapor, working slowly & weakening in its dieing days formed its crystals in ~~th~~ minute filaments attached at right angles to the ~~fou~~ foundational crust. On breaking the little pipe the broken edge looked much like the cut edge of velvet appears, only a great many times more delicate.

A number of specimens of the massive sulphur were taken from the different vents still in a hot condition. When the specimen was exposed to the cooling influence of the open air, a great series of faint crackling, snapping sounds were given out — the sound of the crystals ~~forms~~ forced to rapidly assume their crystal structure.

43. The location of the solfataras seemed controlled by the location of favorable fissures & openings in the much broken basaltic flow through which ~~they~~ the escaping energy reached the open air.

The deposit of sulphur is takes the ~~first the~~ structure first of the thick, heavy, yellow mass, then upon this a blanket of thin loose particles & the whole covered by thin film of almost white sulphur powder.

The amount of the sulphur deposit was not closely surveyed, but it is safe to say that there are were hundreds of tons of the ~~same~~ element there.

About noon of the 9th. when the large crater was first viewed. an area ~~was observed in al~~ of solfataric action was marked, by its light colored area, as being located about the middle of the peninsula first described. It seemed entirely at rest. but on the return in the evening it was observed to be in action.

Another small column of vapor was seen rising from a point in the floor in the crater observed to be quiet in the a.m.

Albemarle.

March. 15, 1906.

About 3 miles W. of Cape Rose. (Chl.) is a small inlet, the landing point of todays operations. Traveling over the country & viewing it structurally, it appears as a fairly recent flow which has arisen from side vents on the 4700 ft. crater & from vents ~~toward~~ to the N. & to the W. of the 3100 ft. crater. The two flows met some ~~first~~ 1½ miles from the coast & then flowed parallel to the coast.

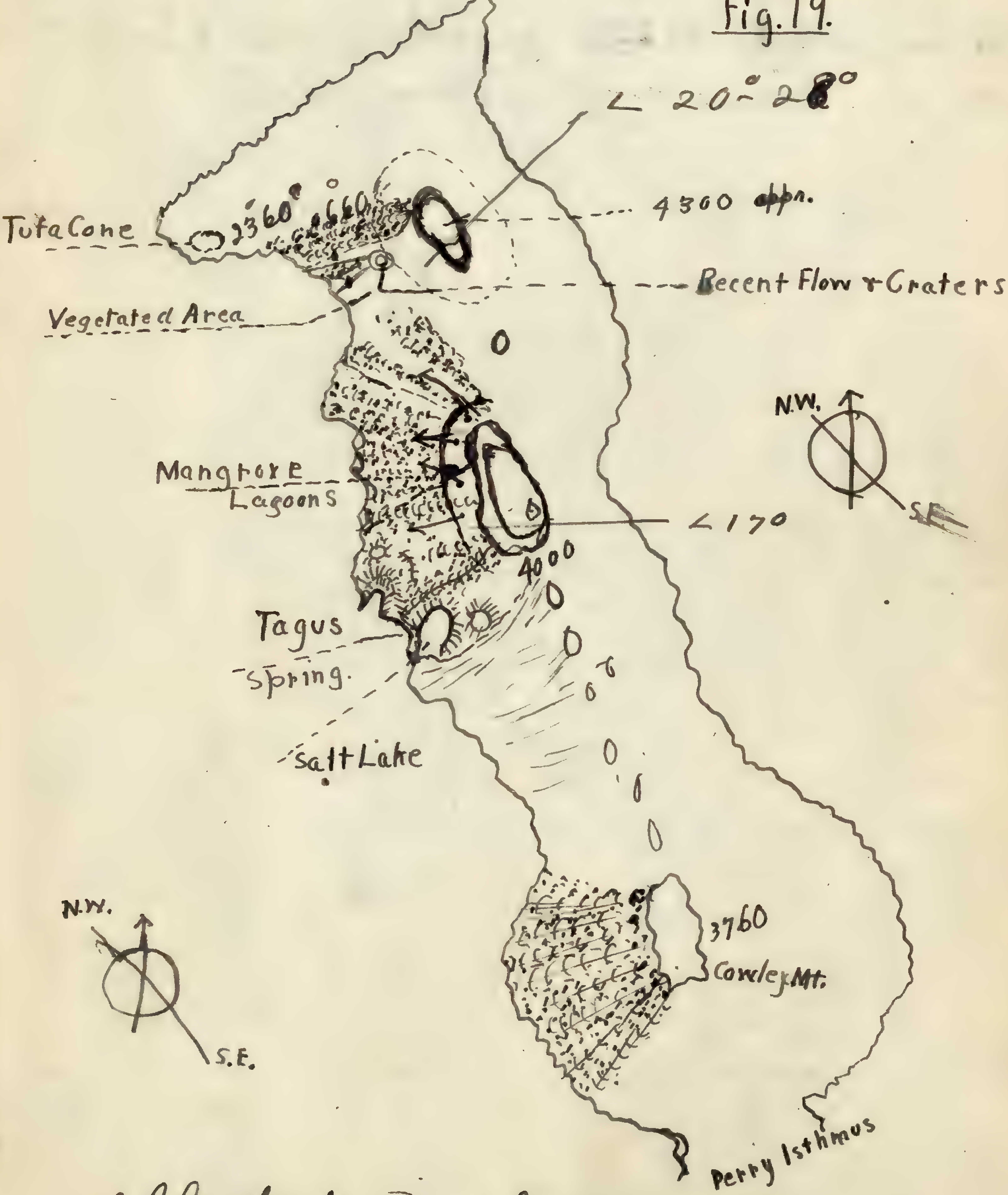
The interesting features of the area is the illustration of its vegetation population from the vegetated areas to the E. & W. of the district considering its recent flow is fairly grown with trees, cacti, & vines. The W. district was the closer & stronger

Another consideration is the example of how when a warm flow strikes the ocean it becomes cooled to form a sudden & precipitous coastal front. This condition of course being possible where the angle of flow is exceeding small & the distance already travelled fairly great in proportion to the size & volume of the lava outflow.

as shown by the fact that as the W. area was approached the vegetation encroachment became the more abundant over the eastern district of the recent flow.

Albemarle

Fig. 19.


∠ 20°–28°
2360
660
4300 appr.
Tufa Cone
Recent Flow & Craters
Vegetated Area
N.W.
S.E.
Mangrove Lagoons
∠ 17°
4000
Tagus
Spring
Salt Lake
N.W.
S.E.
3760
Cowley Mt.
Perry Isthmus

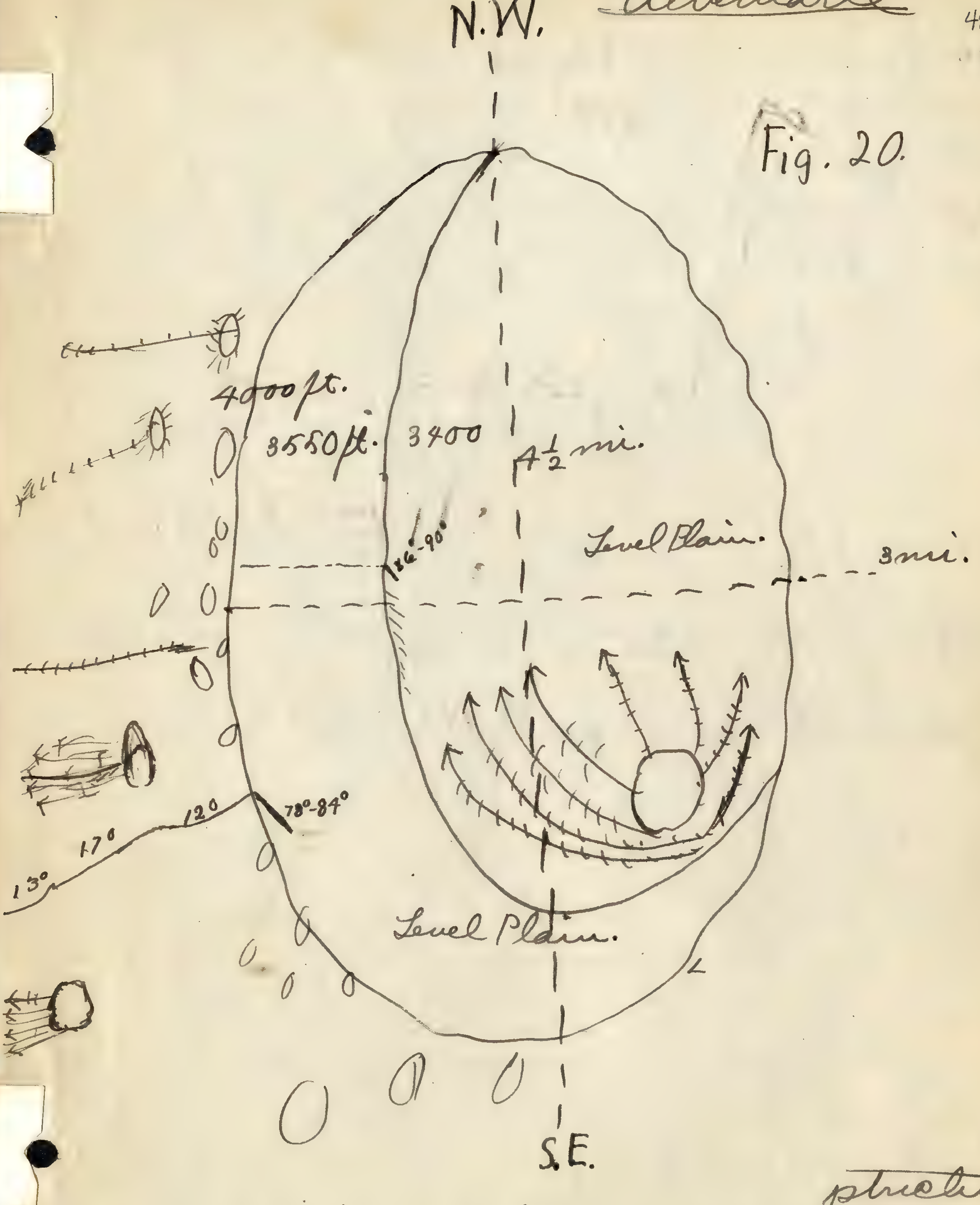
Illustrating the position of 4000 ft. crater & territory about Tagus Cove.

47. From vessel in 14 f. the N. end of 4000 ft. crater bears N.-N.E. South end about E. ½ N.

The large tufa crater marked "salt Lake" lies S.E. from same position of vessel.

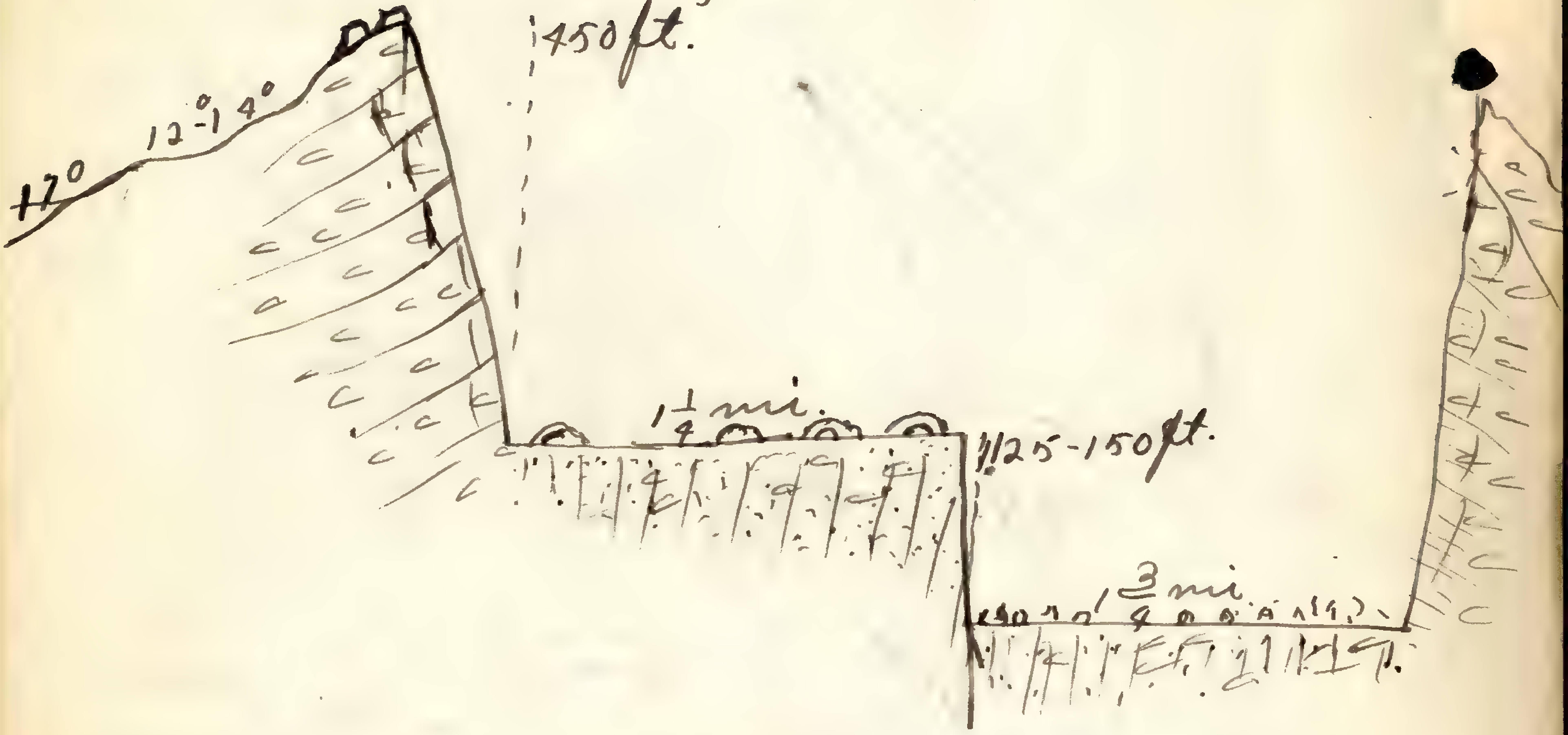
Albemarle

Fig. 20.


N.W.
4000 ft.
3550 ft.
3400
$4\frac{1}{2}$ mi.
86°-90°
Level Plain.
3 mi.
78°-84°
12°
17°
13°
Level Plain.
S.E.

General slope, dimensions & ~~form~~ structure of great crater beds of Tagus Cove.

Fig. 21.


450 ft.
17°
12°-14°
1 1/4 mi.
125-150 ft.
3/4 mi.

The great crater in imaginary cross section at the largest N.E. - S.W. diam.

Albemarle

March. 26-27 Tagus Cove

ascent of great crater back of cove.

Beginning at the watering place (see chart) the country for a distance of 1½ miles is a nearly level, tufa soil plain, bounded in the S. & N. by two large tufa craters. The side of the crater presents a much seamed & furrowed surface. ~~[illegible]~~ the whole is covered by a thin growth of vegetation. The vegetation ~~has~~ presents a patched & striped appearance due to the long narrow streams of recent lava. These lava streams have their origin in the numerous large monticules near the rim of the great crater & ~~[illegible]~~ from the great fissures which beginning at the monticules continue to the bottom of the mt. & spread out in great fan shaped fields over the horizontal tufa fields below.

Of the recent monticular lava flows there are three prominent for their size & extent. ~~Directly~~ Bearing N.E. from the watering place a large one comes down to the plain & forms the ~~f~~ easiest path of ascent. Where the flow reaches the plain by a narrow neck it immediately spreads out in a fan shape, about 1¼ miles. greatest diam. by ¾ mi. With the beginning of the ascent the flow takes the angle of 17° slope which ∠ is maintained & approximates the average slope to the elevation of ~~2000 ft~~ 2600 ft. where the parent monticule of flow is situated.

Throughout its whole length the flow is split in twain by a great fissure. The fissure varies from ~~a few~~ almost flush feet to 10 or 12 ft deep in some places, by 4 – 12 ft. wide. The differences in depth are due to the damming up effects of the rapidly cooling lava stream in the fissure itself. Thus ~~forming~~ actually filling the fissure to its brim & causing ~~a flow~~ a lateral flow from the sides The greatest depths in the fissure were observed just behind the dams.

Several large volcanic bombs were observed in the flow. They have a decided boulder appearance, smoothly round & dense. The size they varied from 18 inches to 5 ft. in diam.

Above the parent monticule a line of fissure weakness could be traced quite to the rim of the great crater, & ~~[illegible]~~ seemingly a prolongation of the large fissure just described.

The lava stream has a width of 100 - 150 yds. average.

The lava itself is highly vesicular. The little vesicles are ~~filled~~ & coated & plated with the brass like iron pyrites. This ~~(Mention the small dribblets)~~ structure has made the flow weakly resisting to the breakdown agencies, & at this time the rock interstices are well filled with the fine, loose cinder like residue of lava breakdown. The presence of the pyrites has assisted materially in the rapid breakdown of the lava. For though there is no historical record for the flow, comparing it with other flows & the general rapidity with which the vegetation takes advantage of the newly formed soil, it is evident that the flow is rather recent. Of course, the presence of the pyrites made offer resistance to the growth of vegetation. (Study further.)

(Mention the small lava dribblets)

Crater -

The rim of the crater is peculiar in that the largest & most of the monticules are situated along it. — sometimes at the brink of the rim, but usually from 100 - 300 ft. lower down. This would indicate the great strength of the restraining walls at the time of the closing up activities.

It is indeed a grand sight as one reaches the rim & looks out over the great crater. The walls are nearly perpendicular, and are composed of solid basalt. The basalt takes the form of layers, averaging 3-5 ft. thick. The layers are themselves again cracked so that the lava has the form of great cubical blocks neatly fitted in, resembling an old weathered wall of masonry.

The dimensions & general structure form of the crater are figured in figs. 20. & 21. The structure is that of one large crater within a larger one. The first level, working downward is quite level, being broken only by small vapor openings. The whole is smoothly covered by a light reddish cinder.

The 2nd. ~~level~~

As indicated in the figs. the first level drops off abruptly in perpendicular cliffs to the 2nd. level. The floor of this level is a rough, highly vesicular lava which has has been a recent outflow, having its origin in the lesser crater situated ~~quite~~ near the S.E. border of the crater

Alternative

This closing crater in the activity of the inside of the great crater has considerable size — approximately 500 ft. high by 300 ft in diam. It may be due to the very considerable size of this vent which has lessened the stress at the sides, granting that a relief of pressure & general cooling is sufficient to quiet the eruptive activity. (This latter consideration must be coupled with the first — of the strength of the rim walls. — that the energy must be finally exhausted here.)

Coast Near Watering Place

In Fig. 19 the location of the great tufa crater is marked, called "Salt Lake". It will be observed that toward the coast ~~the~~ at the ~~[illegible]~~ spring the dip of the tufa layers is nearly N.W. — ~~to~~ slightly W. of N.W. at the coast. This ~~a~~ long continued, though slow erosion of the surf has broken off the ~~ot~~ N.W. margin of the tufa layers to form a sea wall varying from 35–50 ft. high. This cutting ~~[illegible]~~ of the layers has nicely exposed the structural features of the tufa beds & the depth of the height of sea-wall

stated.
The following figure illustrates the structure:-

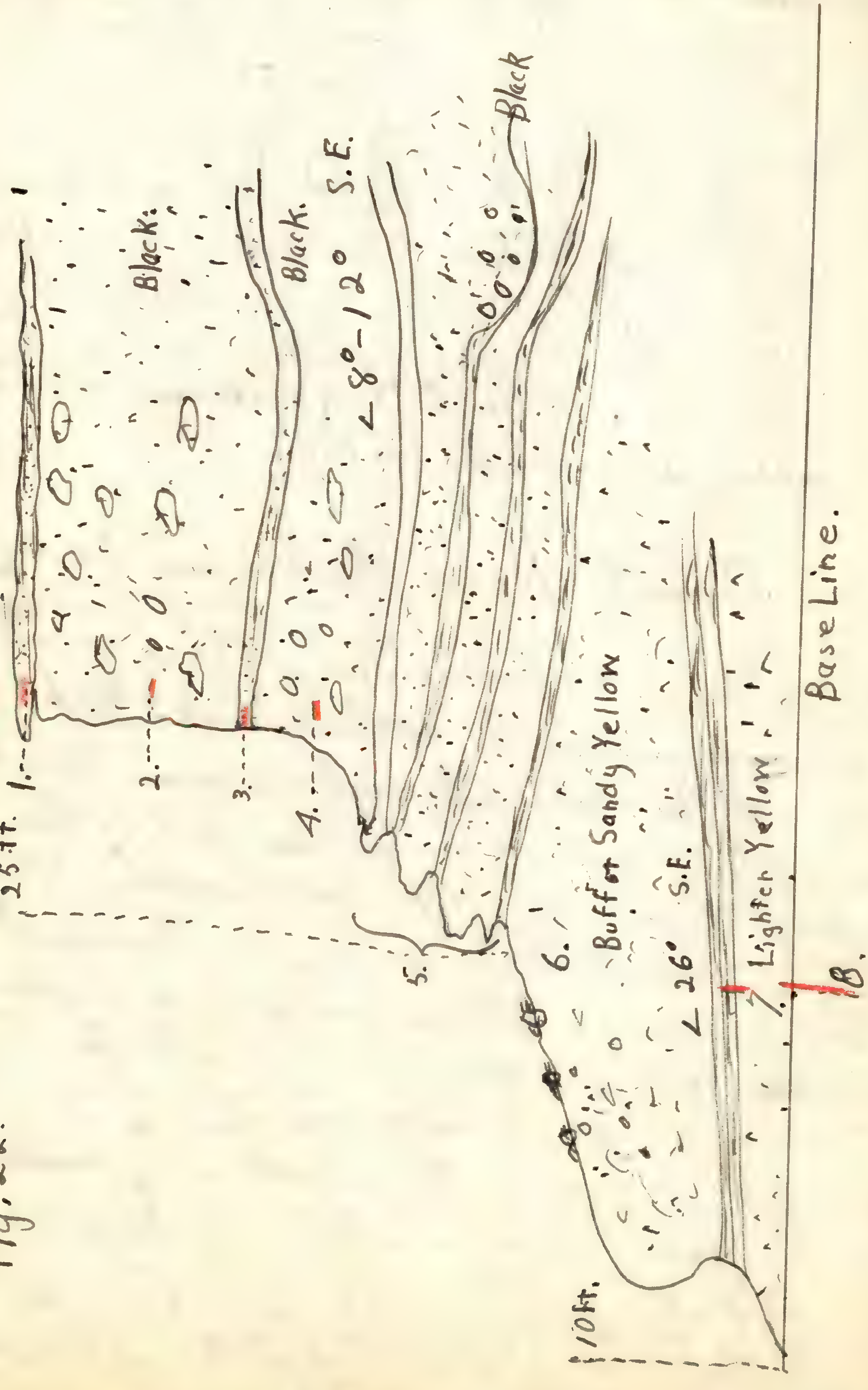

Black.
Black.
Black.
Black
∠ 8°-12° S.E.
1.
2.
3.
4.
5.
6.
7.
8.
25 ft.
10 ft.
Buff or Sandy Yellow
∠ 26° S.E.
Lighter Yellow
Base Line.

Fig. 22.

Albemarle

The total perpendicular height of the cliff at this point is approximately 85 – 38 ft.

1. Is the last tufa layer which constitutes a cap for the whole. – 3 – 5 ins. thick: of a reddish, sandy yellow.

2. 10 ft. thick: loose black sand: containing a loose conglomerate of angular, black, crystalline rock. This enclosed rock has a schistose, parallel cleavage, & resembles a schist, altered by heat. Specimen No. 51. is taken from one of these enclosed fragments. Some of the fragments have a roundish boulder character – probably a greater degree of heat. No. 52. chips from same. No. 50. is a good specimen of the stratum.

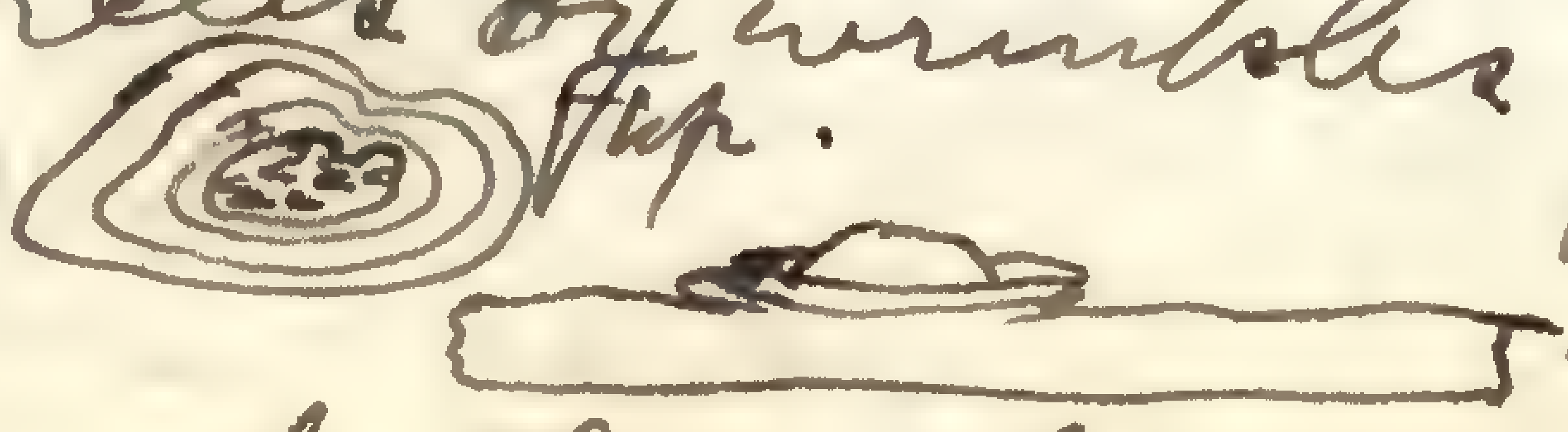
The schistose character of the enclosed fragments is probably important as a possible consideration of the origin of the lavas & the general basis for the group of islands. It has already been stated that a possible origin of basaltic lavas is a schist. (Le Conte.)

3. Is a thin layer of the same black sand material as "2." but slightly harder & containing little or no conglomerate of size.

4. Much the same structure as "2". slightly harder, not as bad as "3", & containing smaller & more roundish ~~conglomerate~~ conglomerate than "2".

5. Alternate beds & crusts of the black sand, & the above layers - no conglomerate. Extruded edges show the relative degree of ease of erosion.
Notice the pocket of conglomerate.

6. This constitutes the great real tufa basis for the whole. It is of a dark buff, tending to a sandstone yellow. Rock specimen No. 49 illustrates the texture & structure of this particular formation. As indicated this structure too has lava block enclosures ~~Above the~~ As the formation is slowly eroded away the enclosure project above the otherwise smooth surface. The enclosed blocks are surrounded by a banded concentric circles of wrinkles formed about the stone as it was enclosed.



7. Slightly crusty - thin layers.
8. Lighter yellow but much the same as "6". (To be photographed)

Albemarle.

Spring:

At the place marked on the chart: station "Place": ~~The~~ ocean erosion has worn back the cliff to expose the vertical structure of the base of tufa crater. In Fig. 22. ~~it~~ it will noticed that a series of hardened black sand tufa, marked "7" is superposed upon the yellow tufa ~~No.~~ "6". Now at the spring this first layer, that being the one just next "6" is baked, hardened almost to a degree of crystallization. This particular layer, besides leaving a tangible bend in itself occupies the ~~the~~ ~~bottom~~ lowest point of the natural drainage area formed; first by the great mt. on the E., the old tufa cone to the N.; the one to the S. These elevations combine to form a basin drainage area; with the outlet to the N.W. & in direct line with the dip of the hardened tufa layer. At the point of outcrop the impermeable layer is approximately 10-12 ft. below the general surface.

The natural porosity of that structure superposed above the impermeable layer is one ~~calculated~~ fitted to ~~hold~~ retain & filter the scant amt. of rain fall of this

59. territory. This ~~condition~~ faculty of retaining water is assisted by the alternate hardened crusts ~~which~~ indicated in Fig. 22.

Photograph of Spring + superposed stratum is taken.

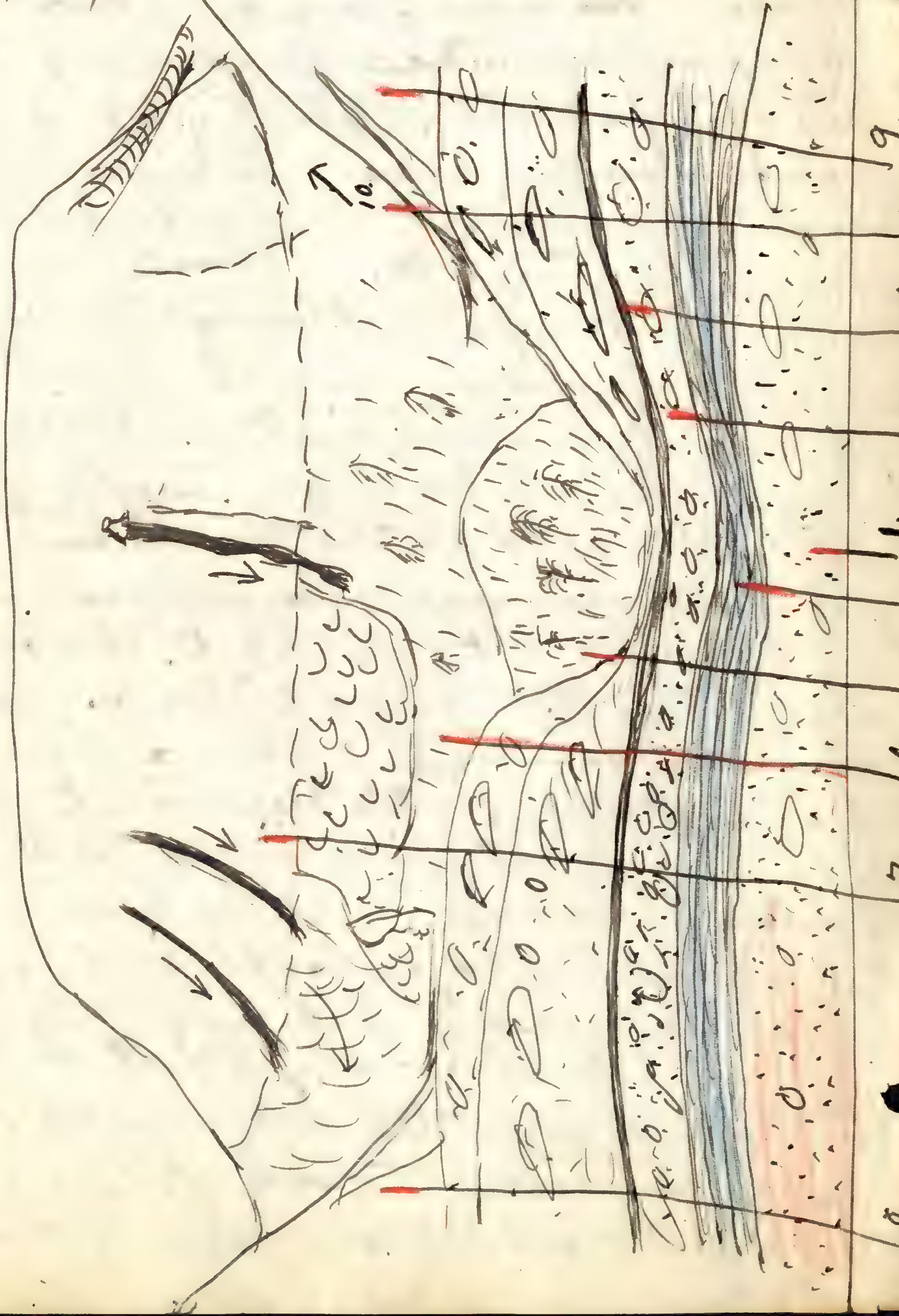


Fig. 23.

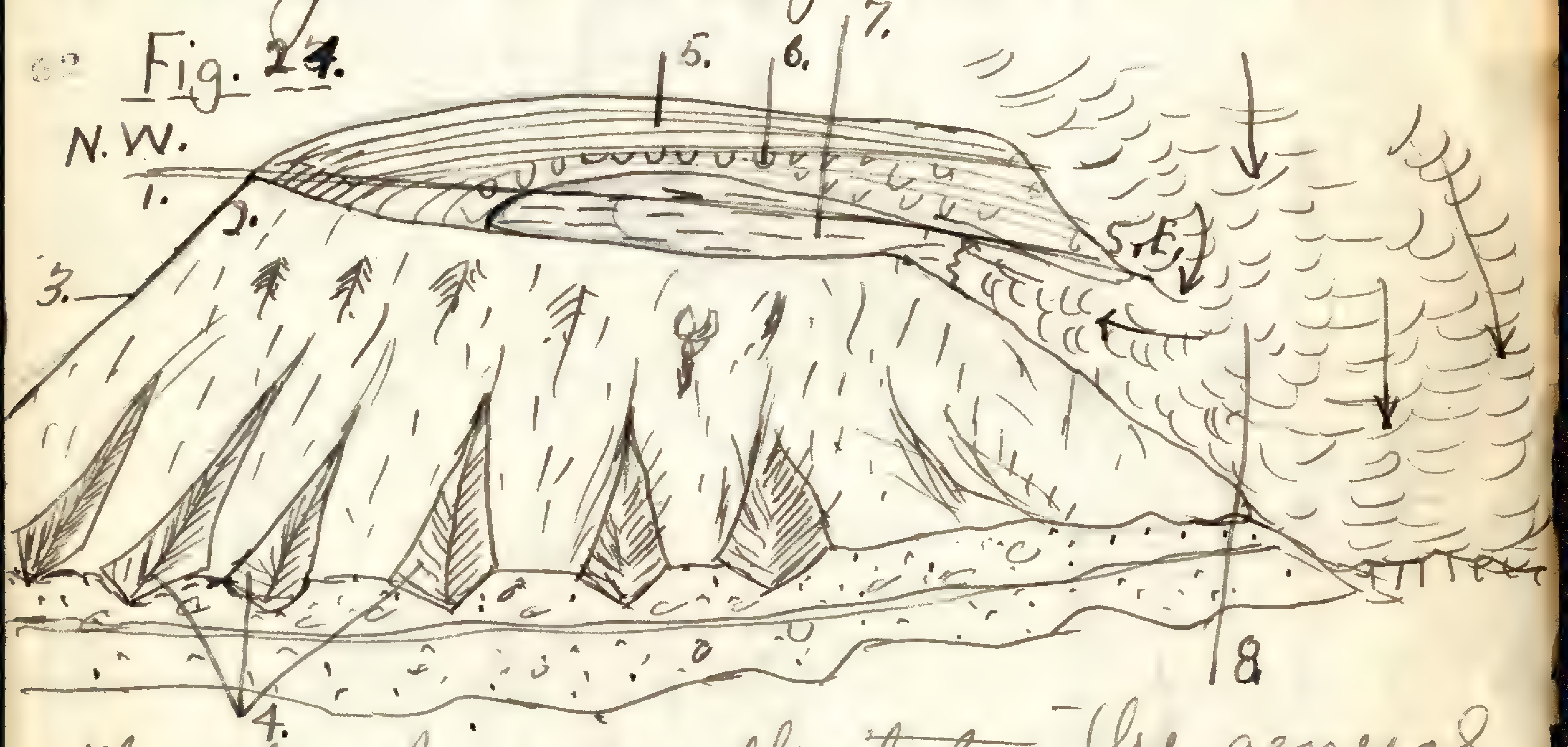
1. Yellow tufa strata proper. 10 ft. thick.
2. Series of thin, hardened, impenetrable ~~st~~ tufa strata which make the spring possible at this point & above the ocean level. 3-5° ~~dip~~ slope
3. Superposed stratum of loose black sand with conglomerate
4. Thin hardened layer.
5. Ravine of erosion leading eastward toward crater
6. Region of basin; slightly dipping plane to N.W. Area some 1½ by 2 miles. Long diam. E & W.
7. Heights of great crater arising in the background & forming the great eastern watershed.
8. S.E. slope of tufa crater forming Tagus Cove. forming the north drainage shed.
9. N.W. slope of tufa crater, forming south side of basin drainage.
10. Valley of S.E. - slight slope

61.

Salt Lake Crater.

During the description of the neighboring territory the Tufa crater ~~A~~ S.E. of Tagus Cove has often been mentioned. Its structure & history is interesting.

Fig. 24.



The above figure illustrates the general shape & structure.

1.) The long diam. 1 3/4 mi. is in a S.E. x N.W. direction. The other diam. N.E. x S.W. is approximately 1 3/8 – 1 1/2 mi. Diam. from rim top to rim top.

2.) The greatest height of rim is 780 ft., which decreases to 600 and less.

3.) The outside of rim 1/2 way from base has an angle of 24°. This remains the average. On the inside the slopes are much steeper 45°–55°

Albemarle. Tagus Cone

4.) The sides generally, & especially those
to the N. W. are much eroded into
ravines at their mouth 20-25 ft. deep
by 40-50 ft. across at top.

5.) The long horizontal lines ~~representing~~ drawn
in the part of fig. representing the
interior are the cross sectional ends of
the Tufa layers. These are the layers
which constitute the surface shell
of the cone & whose topmost strata
are exposed ~~at~~ as the coastal cliffs.

6.) About half way up the inside of the crater
is a strata like tufa formation arranged
with just an opposite dip to the external
∠24° structure, but dipping very ~~too~~
sharply towards the bottom of crater.
They are short, & broken ~~off~~ & form a simple
projecting fragment structure. as ~~those~~
indicated by the looping in fig: part "6".
reason for these

7.) As the large salt lake which now
fills the whole bottom of the old
crater. There are three small crater
vents in the centre of the lake, forming
little islands.

8) The recent lava flow which
having its origin at one of the
monticules of the great crater. at

an altitude of 2800 ft.

To sum up:

1. The tufa crater is one formed in water & perhaps after the first great subsidence which made it a monticular vent.

2. It was once a complete crater, as judged from neighboring ones.

3. The sea ~~evidently~~ broke down the S.E. side, due to prevailing winds etc.

4. When open, it formed a cove similar to the anchorage now called Tagus Cove.

5. The last great monticular lava flow closed the opening to make the ~~crater~~ cove an inland lake

6. Probably a slight elevation of a few feet has assisted the lake formation

An important consideration comes up here

Albemarle

Mangrove Lagoons.

April, 6, 1906.

To the N.W. of the great crater forming the
Cone, the slope of the sides (∠ 24°–26°) –
great lava
descends until it reaches the great crater,
plain, bounded on the E. by the great crater,
on the ~~N.~~ N.E. ~~N. + N.W.~~ + N. by the crater backs
of Banks Bay; on the N.W. + W. ~~by~~ S.W. by the
ocean. This lava field ends rather abruptly
at the coast, that is the last crustal flow
does, but a former ~~older~~ flow extends
into the ocean in projecting points. (The
area & extent of the field can be relatively
determined from the chart.) From the
coast the area of flow extends in a
very gradual angle back to the base of
the great crater, where there are situated
~~two~~ large monticular vents. At this
point, the base of the vent the elevation
is approximately 200 – 250 ft.

But the great flow, & series of flows
which have so completely covered this
coastal plain has had its origin in a
number of monticules situated on the
crater field at an altitude of 2500 –
~~at~~ 3000 ft.

The flow is peculiar. The uniform color
is a medium brown. (Specimen No. 52)
The structure is not highly vesicular.
that is the edges of the vesicles are

rather turned in, giving the whole a plastic appearance. The structure is dense & heavy. The surface of the flow has large patches of hard crust, presenting a smooth, slightly undulating, cinder strewn surface. Near the base of the crater are a few cone like emminences, ~~where the surface is~~ rising 25-35 ft. above the plain. The surface is unbroken; simply blisters in the lava crust. The lava field, with the exception of these smooth areas, is a single jagged, ~~[illegible]~~ fissure furrowed flow. The surface is made rough by the ~~the~~ broken fragments of the crust which forms the smooth areas. Some of the fragments are great plates ~~[illegible]~~ containing several square feet, their thickness (the plates) have a uniform thickness of 4-5 inches.

The whole shows that the mass has flowed into the sea, there to harden into the hard, glassy crust, which crust afterward became broken by the rise above the ocean, & the pressure of the flow from the origin.

The rise has been about 25 ft. ~~as~~ shown by the broken, ocean eroded margin of the N.W. side of the Tufa crater.

Mangroves
Albemarle
Tagus Cove
Cliffs.
Recent Cinder Cones.
Ravines + Fans
Alt. ~~375~~ 450
Bottom of Old Crater Part. II.
Bottom of Old Crater Part. I
Alt 200
Salt Lake
Alt 125
Last Crater
Stream Cut
10.
14.
∠ stata exposed on inside
Alt. 520
15
17
Sea Cliffs.
20.
∠ 26° N.W.
Sea Cliff.
Cliff.
Highest Pt. 817
Cove - Juncture of Old + Newer Craters
x Fresh Water
∠ 24° S.E.
Cliffs.

Fig. 25.

Tagus Cove.

Albemarle

Tagus Cone.

Fig. 25 illustrates the structural formation of the Tagus Cone. In general formation, position etc. it has a counterpart in the one shown in Fig. 24. Its relation to that of Fig. 24 is here apparent & elucidates further the position of the watering place.

The great tufa crater which forms the outer confines of the cone is apparent. Its basin is marked! Sometime before the opening of the large crater to the sea the lesser crater had its time of action to close up the then active energy of the large crater. The basin of the ~~newer~~ later & small crater is now occupied by the Salt Lake. Its sides & position cut the old basin in two nearly equal parts & prevent the further inroads of the sea. The altitudes are marked. It is here stated that the little crater had its activity after the larger one & before it opened to the sea ~~as dem~~ This idea is proven true by the fact that the old crater basin shows no ~~of~~ evidence of having been under water.

On the W the contact of old & newer craters is marked by the little cone & the deep ravines reaching nearly to the ocean level. On the E. the junction has been somewhat cut by a ~~Sh~~ stream, resulting from a drainage of the region of Part 1. of old crater. At this stream cut the alternate variety of tufa layer structure is exposed: first a reddish sand layer then a black mud-like structure alternate ~~for~~ until 3 of the first & 4 of the 2nd. are exposed. (These layers correspond to the strata described & sampled in Fig. 22.)

The outside of the great crater has a slope varying from 26° - 30°. On the inside the sides slope rapidly at 52° - 58°. Near the top of the inside of the crater & extending half way down to ocean level, the tufa strata which form the outside of the crater are exposed. &

The old sea cliffs, recent flow & mangrove lagoons on the N.W. are located.

The peculiar condition of the whole is the the ~~position &~~ existence & position of the two cinder cones at the very top of the north rim of the great crater. at the juncture of it & the former crater. From a consideration of these it would seem that as the subsidence proceeded the level of activity was carried higher until the closing scene in the active life of the great crater was enacted in these cinder cones at their relative great height.

It may be that the opening into the great crater was formed by a subsidence.

Albemarle

Bank's Bay

The position + structure of the great crater back (E.) of Bank's Bay is much like that of Tagus Cove. The distance from coast to base of mt. is about 3 miles. This is a nearly level plain, with only a rise of 100 ft. before it ~~begins~~ joins the rapid slope of the crater itself. The whole plain is cut into two strips: a large barren recent lava flow on the N. half; a light dusty, vegetated area in the S. half.

The vegetated area has arisen from the rapid break down of cinders, old lava & pumice of this older & undisturbed region.

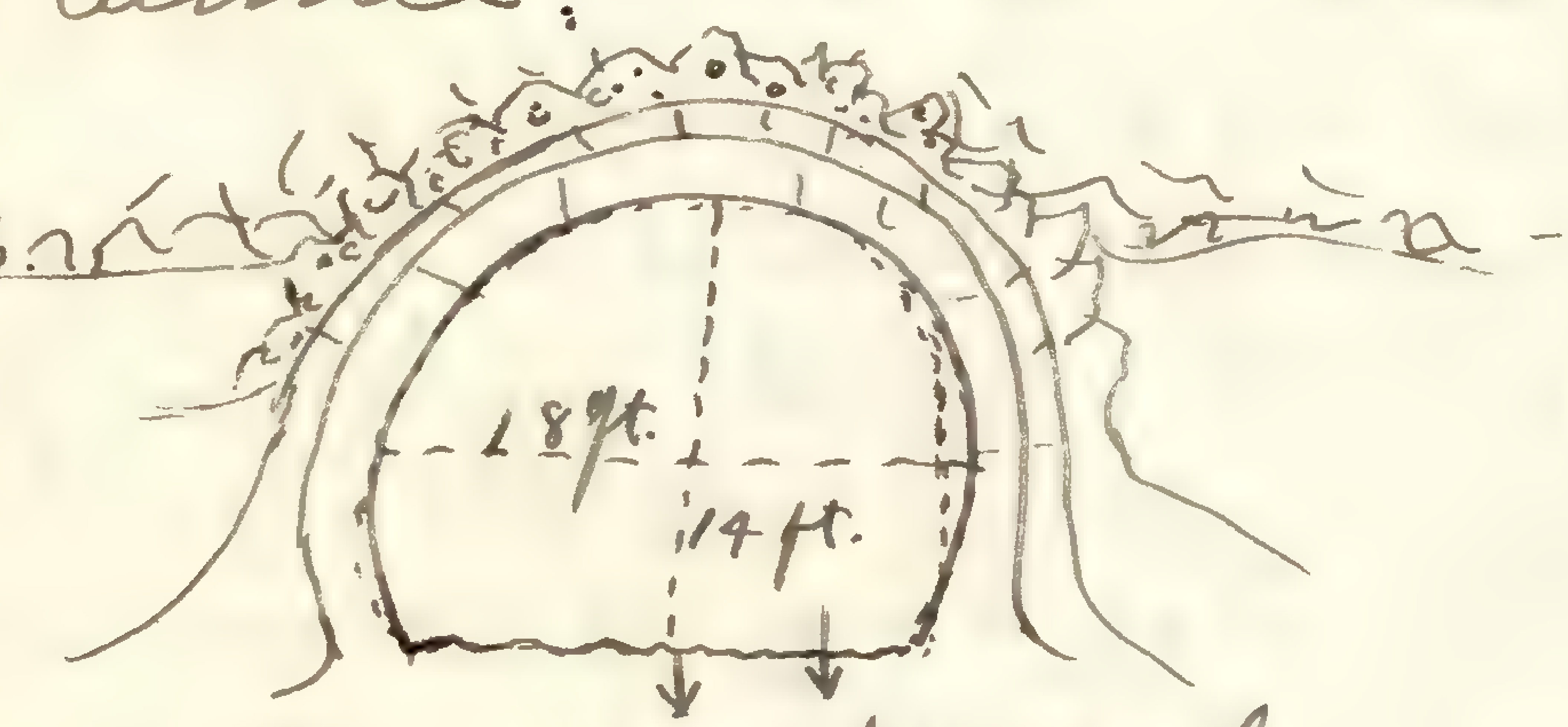
The vegetation of the side of the crater is rather well developed - due not so much to ~~the~~ a greater age of this mountain over that at Tagus Cove where the vegetation is thin - but rather to the cinder slopes & light lava which forms the surface of the mountain. + the addition of the rather abundant pumice

Use in Notes on Land Shells.
+ Geology in Soil Formation

At the base of the mountain is a large crater. ~~about~~ some ½ mile in diam. enclosing two smaller ones within it, all arranged concentrically. From this crater has arisen the flow which covers the north region of the level coastal plain ~~above~~ described. These craters are broken out in the N.W. & the flow begins its course in that direction & then sweeps off to the W. to reach the lower levels of the coast & there spread out.

Beginning near the break in the wall of the crater and extending for about 300 yds. in a N.E. direction is a fine example of the surface cooling of lava & the under flow of the blanketed mass to form a large lava tunnel.

Fig. 26



Cross section of lava tunnel

The sides & roof of the tunnel was formed of a solid slightly vesicular mass of basalt. Near the outer sides, the roof particularly, a sort of layer structure is noticeable & a tendency to break up into large angular blocks. ~~In the ou~~ This outer layer rapidly passed into the loose, jagged, highly vesicular rock froth of the general surface of the flow.

Albemarle

Banks Bay.

Where the structure of this tunnel was exposed by a falling in of the roof. the great cavern was entirely clear of debris. The floor was formed of a hardened river of lava: the little ripple marks congealed on its surface. Within the tunnel the ∠ of flow is 5°-9°.

Immediately above the craters & tunnel described. the great crater mountain rises rapidly at an angle of ~~18~~ 20°-~~24°~~ 26°. This is surprisingly steep, even equal to the angle of tufa flow, but can be accounted for by the ~~[illegible] of~~ the great cinder cone formation of the whole. Indeed the two large, old basaltic flows investigated stand out as ridges which near the base of the mt. say from half way down to the base. have a much less angle of slope.

The south half of the mt. as it fronts the Bay is streaked by two runs of recent lava. ~~It is~~ the flows are basaltic ~~& the flow~~ and extends down to about 1,000 ft. alt. They arise from two vents ~~near the~~ just below the rim of the great crater. & about

1½ miles apart.

On the N. & N.W. slopes of the mountain are large flows, arising like the two small ones from vents near the top. These flows cover the great plain clear to the coast.

Should be mentioned that the two small flows on the S. ~~are~~ have flowed within the last 8 or 10 years: larger flows probably within 30-50 yrs.

Again a consideration of the relative age between this & Tagus Cove mt. would indicate this slightly the more recent in activity.

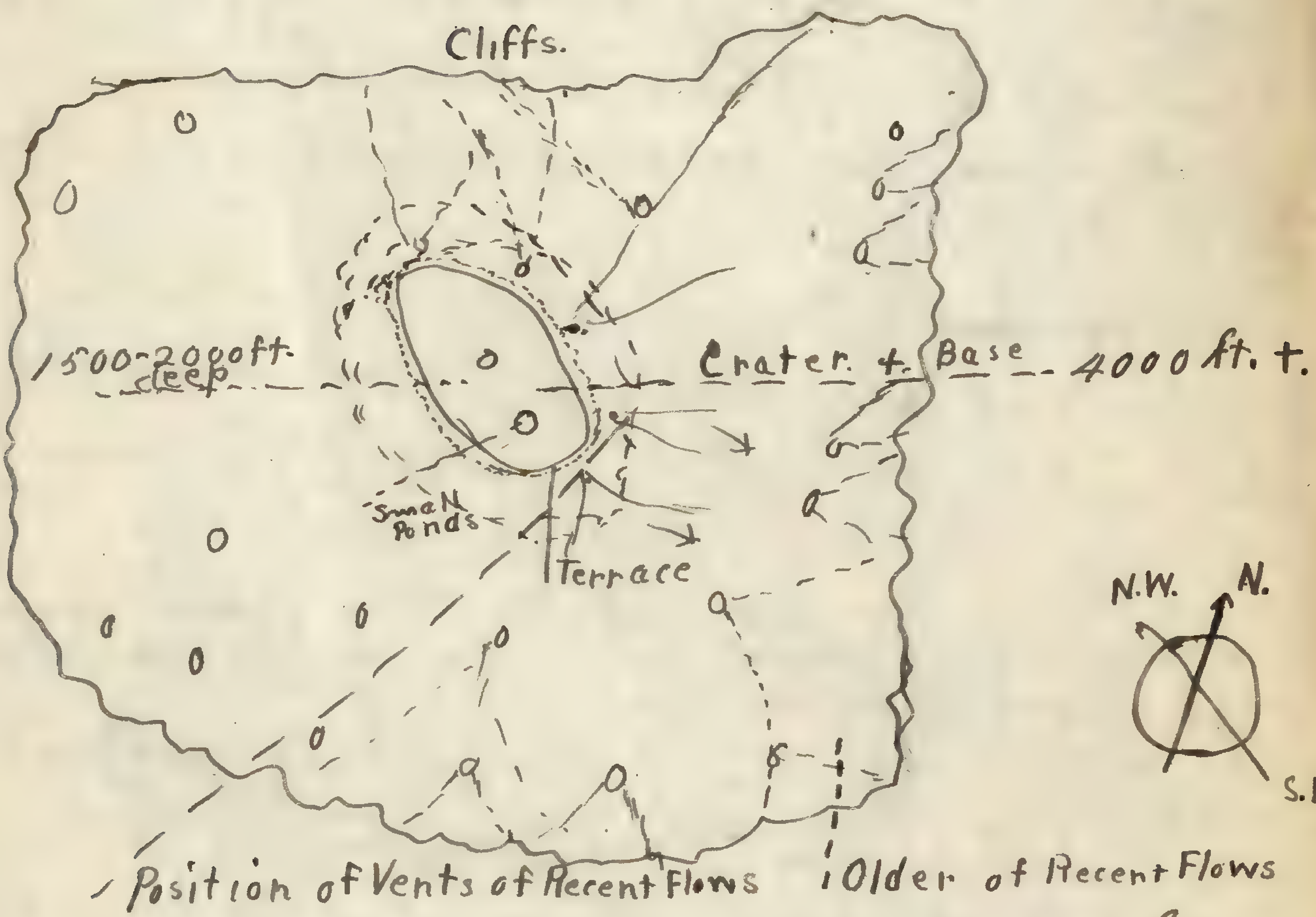
The large crater cone which forms the promontory of Point Berkeley is of ~~old~~ tufa origin. It stands on the point washed by the ocean on three sides. Its sides are very precipitous due to the breaking away of large fragments by the ocean's eroding agency. One immense part of the crater, broken off but still above the surface forms Redondo Rock.

Another example of the fact that all outlying points & islets are of tufa formation.

~~Narborough~~

Narborough.

Fig. 27.


Cliffs.
1500-2000 ft. deep
Crater + Base -- 4000 ft. +.
Small Ponds
Terrace
N.W.
N.
S.E.
Position of Vents of Recent Flows
Older of Recent Flows

General outline map of Narborough Employed mainly to show ~~the~~

1. Trend of major diam of great crater.
2. Region of subsidance - ocean erosion - Cliffs.
3. Relative position of vents producing the older & more recent flows.

The whole surface of the island is covered by patches of fairly recent lava - of various relative ages. The vegetation of the place is left in isolated islands.

All of the vents which supplied the older of the recent flows are within the 500 ft. line of alt. The vents which supplied the same recent lava are just below the rim at approximately a uniform height of 4000 ft.

The relation of this to rise in alt. of vents due to subsidence. mentioned in "Occasional Ideas" and developed for importance.

The N. shore of the island has been broken away to form the sea-cliffs. These cliffs are 50-80. ft. high and expose nicely the ~~old~~ flows of lava which followed each other with the regularity of strata. They ~~are usually~~ average 5 ft. of solid lava, then a thin crust of the reddish vesicular, frothy stuff, followed again by a repetition of the same, until 5 flows are exposed at the highest point of the cliffs.

A lava tunnel was broken across at the time of break off of the cliffs & ~~illustr~~ shows an excellent view of the cross section. The tunnel is some 10 ft. above high tide.

On the N.E.; N. & N.W. sides the coastal plain is quite level & ~~then~~ until it meets the base of the crater, which rises rapidly possibly at 25°-30°.

Albemarle, Cowley, Mt.

Aug. 10-11-'06

The great crater known as Cowley Mt. 3780' alt. has a well preserved rim rising abruptly at an angle of some 28°-35° the last 500 ft. of its ascent. Below this it dips away gradually in a long sweep to the W. & coast of the island. On the east the rim rests upon a series of great terraces the last & the upper at the immediate base of the rim is perhaps 1½ miles wide. The rim, & the N. W. & S. sides of the mt. are covered with a basaltic flow - now turned to the reddish brown of break-down.

The whole E. side of the mt. beginning with the eastward slope of the highest & broadest terrace is covered by one great pumice deposit.

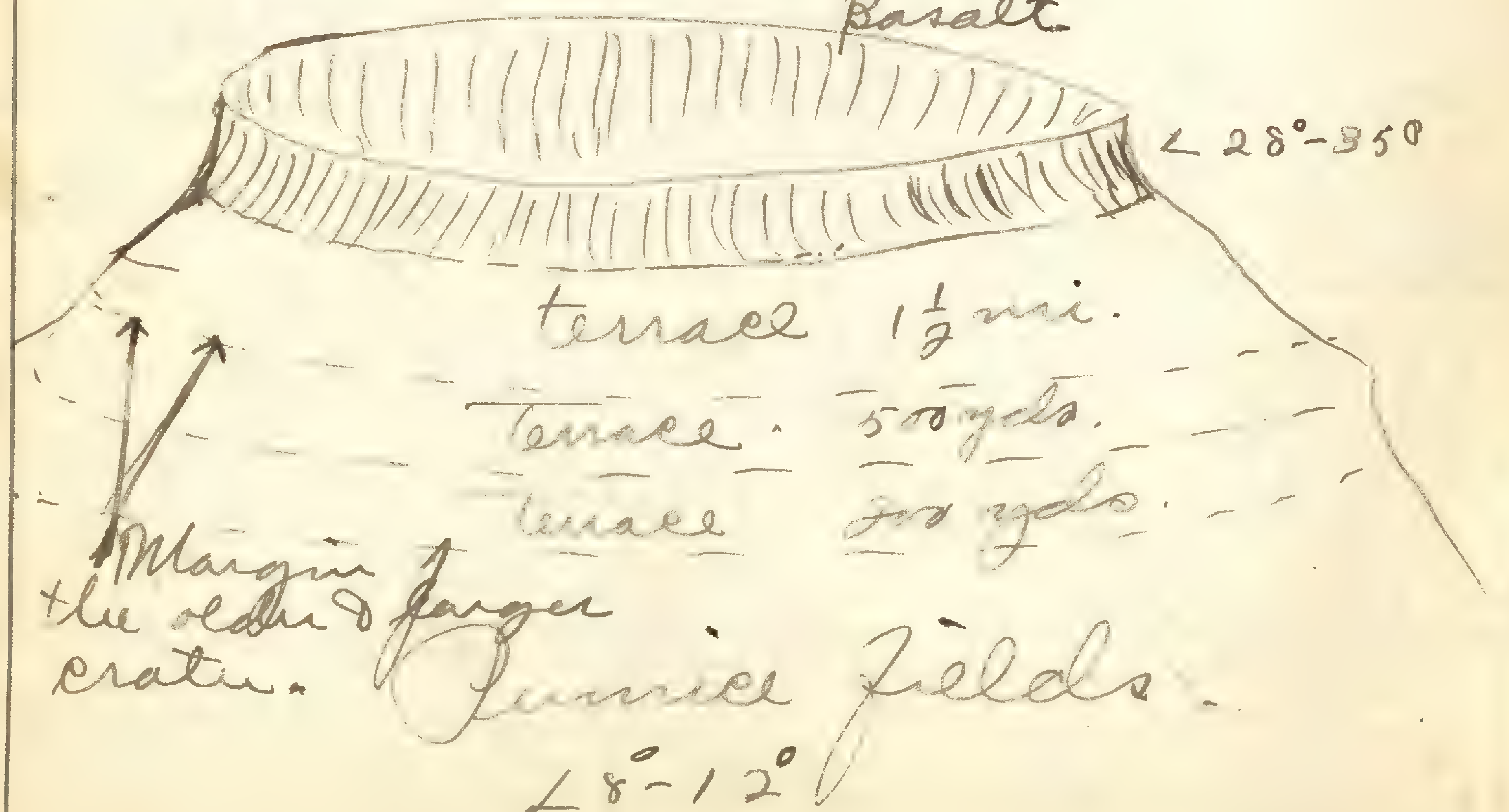
The pumice flow is superposed above the usual [illegible] basaltic lava which outcrops at the sea-shore & at the S. margin of the deposit.

The pumice fields are about 4 ft thick at the coast - then gradually thicken inland until they probably reach a thickness of perhaps 25'.) Old steambeds ~~[illegible]~~ have cut the deposit to a ~~depth~~ of ~~about~~ 10-12'. ~~Through~~ These cuts revealed no admixture of other structure, - it was pumice all the way down.

The deposit is generally loose & frothy which might destroy its commercial value. Sp. No. 80. are good specimens of the deposit taken from the perpendicular sea-cliff.

Sp. No. 81 - are little loose particles lying about on the pumice fields.

The recent basaltic crater, thus stands at the W. side of the larger & older crater.


Basalt
∠ 28°-35°
terrace 1½ mi.
terrace. 500 yds.
terrace 300 yds.
Margin of the older & larger crater.
pumice fields.
∠ 8°-12°

Albemarle, Villamil.

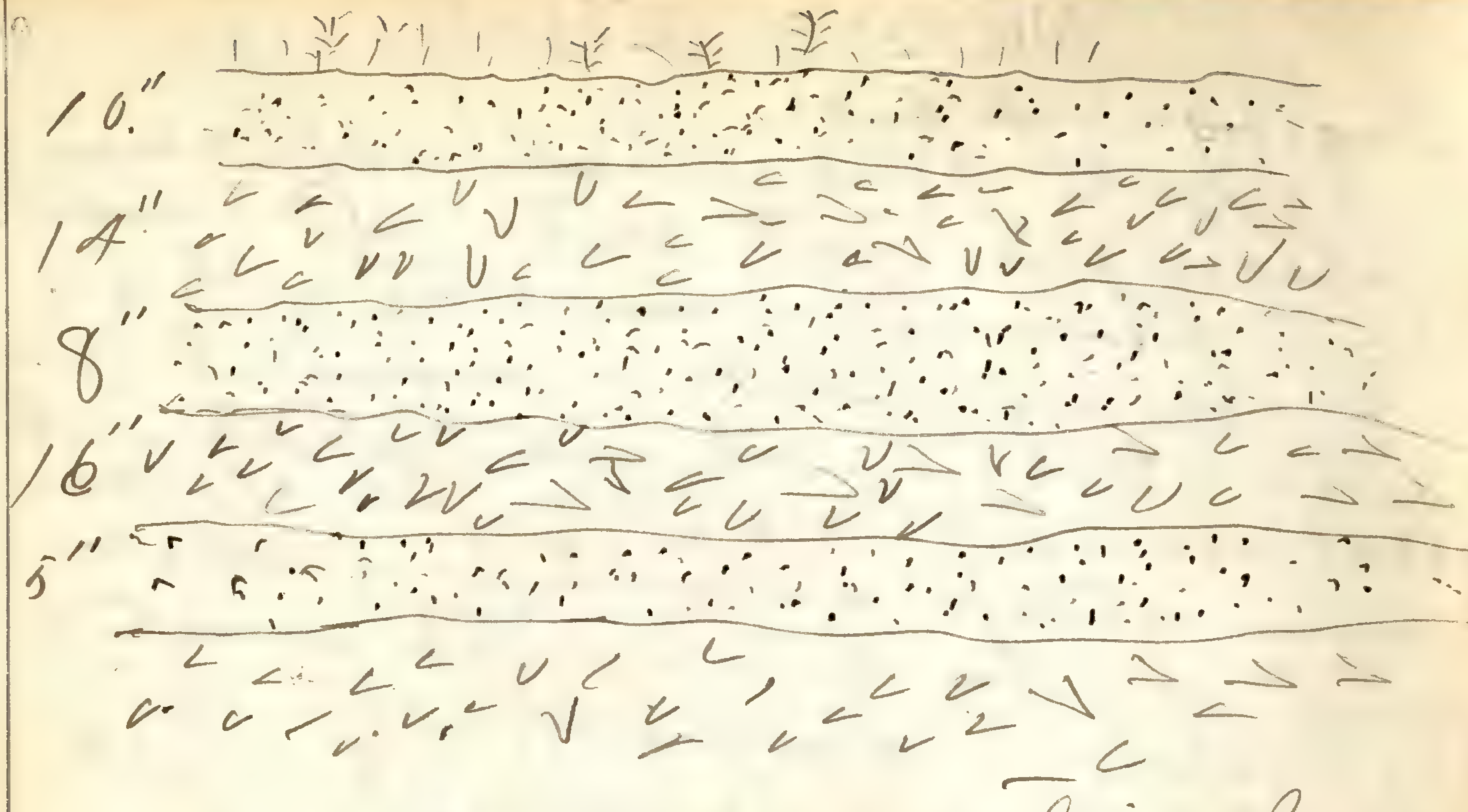
Aug. 20 - Sep. 5, '06.

Most of the general surface aspects of the great crater mt. have been discussed in ~~an~~ early notes.

An important discovery at the time of this visit was the determination that the last lava flows which have been interspaced with long periods of quiet similar to the present conditions of breakdown and vegetation.

Just above the hacienda at an alt. of 1300' the builders of the settlements have exposed the position of three separate flows. The flows vary uniformly from 12-16" thick. throughout the 12' of exposed edge.

Above the first lava flow is the present soil with a thickness of 10". Then between the upper & 2nd. lava flow layers is a 2nd. soil bed, reddish, light, burned-clay-structure like the first. 8" thick. Then between the 2nd. & 3rd. layers is a third soil layer with a average thickness of ~~6~~ 5".



The exposed cross section shows a historical gradation :- from the bottom upward the layer flows ~~the~~ have a decreasing thickness - indicating a gradual cessation of volcanic activity. Then too the lava becomes more vesicular toward the ground surface.

From the upper surface down the soil layers present a decreasing surface :- again showing that as the time of complete stoppage of activity drew near there were longer and longer periods of quietude.

Important as indicating the great remoteness of conditions suitable to plant and animal life.

Chatham Island

Oct. 18 - 1905

Observations confined to the road leading to the settlement & to beach region of Wreck Bay.

Following the road inland the ascent of 1000 ft. to the settlement is made in 3 long gradually level stretches formed by two parallel ridges of lava rocks. The same lava ridges are parallel to the coast.

The whole ~~lower~~ zone (0-700 ft) is quite covered and strewn with lava blocks & traces of lava streams much eroded. Between & under the stones is a heavy red. clayey. soil. It is used in making the surface of the road. It's appearance indicates it's origin as the broken down red lava flow already observed as common.

From 700 ft. upward one finds himself in a region of continual moisture. The surface soil here is a black, some streaks of red, sticky. soil. having a rather plenty admixture of round dark lava rocks. At this altitude (700 ft.) the actual cultivation of the land begins.

During the next 300 ft. of ascent the number of lava boulders scattered about the fields becomes much less & one observes that the region of complete surface-rock break-down has been reached. The soil in & about the settlement is a thick, sticky clay mass, whose tenacity in clinging to one's boots is quickly apparent.

The elevation of 1000 ft. seems to be a region of almost perpetual ~~moist~~ cloud condensation. Not only during the brief visit was this [illegible] observed. But from the bay the mist ppt. from the low hanging clouds was easily seen. This attracts the attention rather quickly for the region of the bay is almost without heavy mists & the road was always dusty. With ~~such~~ so heavy an amount of moisture the reason for such a soil as that of Chatham is obvious, though volcanic in nature.

Had occasion to sail to the N. around that end of the Bay. Here the lava flow ~~s~~ comes to the ocean in a small sea-wall of some 5-15 ft. high.

Old Beach.

The white beach sand of Wreck Bay is composed of broken marine shells & a small amt. of what looks like coral. About ~~100~~ ~~150~~ 200 yards inland from the beach are two large walled in pits of perhaps 4-6 ft. deep. These are the lime pits from which the old Mexican makes the white ~~lime~~ ~~sand &~~ dust like lime exported from the island. About the pits - covering an ~~region~~ area 500 yards to the S. 200 yds. N. & 50 yds. inland is an open space almost destitute of vegetation. The surface of the ground is a hard, smooth, cement like structure, much like the appearance of a cement floor. This is the natural cement of the lime in the soil. By digging through this hard crust it is observed that the whole sub-soil is a white, compact sand, exactly like the shell sand of the beach. It is the lime of this shell-sand, secreted by the little shells many years ago which is the lime of commerce. The lime pits mentioned are simply the points at which the lime sand is taken & prepared as lime. The greater part of the process seems a pounding & sifting of the loose chunks of hardened sand.

Can. No. 1. is a fair sample of the lime made. Can No. 2. is a number of specimens of the sand just as it is ~~before~~ dug out of the floor of the pit. +

The whole region about these lime pits is an old beach. It's present altitude is about 25-40 ft. The side limits seem marked by the two horns of the bay & on the inland to side is marked by an abrupt lava flow. The lava flow seems to be more recent than the beach for on the N. border, Specimen No. 23. was taken which shows a contact between the lava & beach sand. From the under side of the lava blocks ~~a num~~ imbedded in the hard encrusted sand. a number of recent shell forms were taken. They are in the bottom of the large biscuit can.

Chatham

Feb. 12. 1906.

Fig. 16. 17

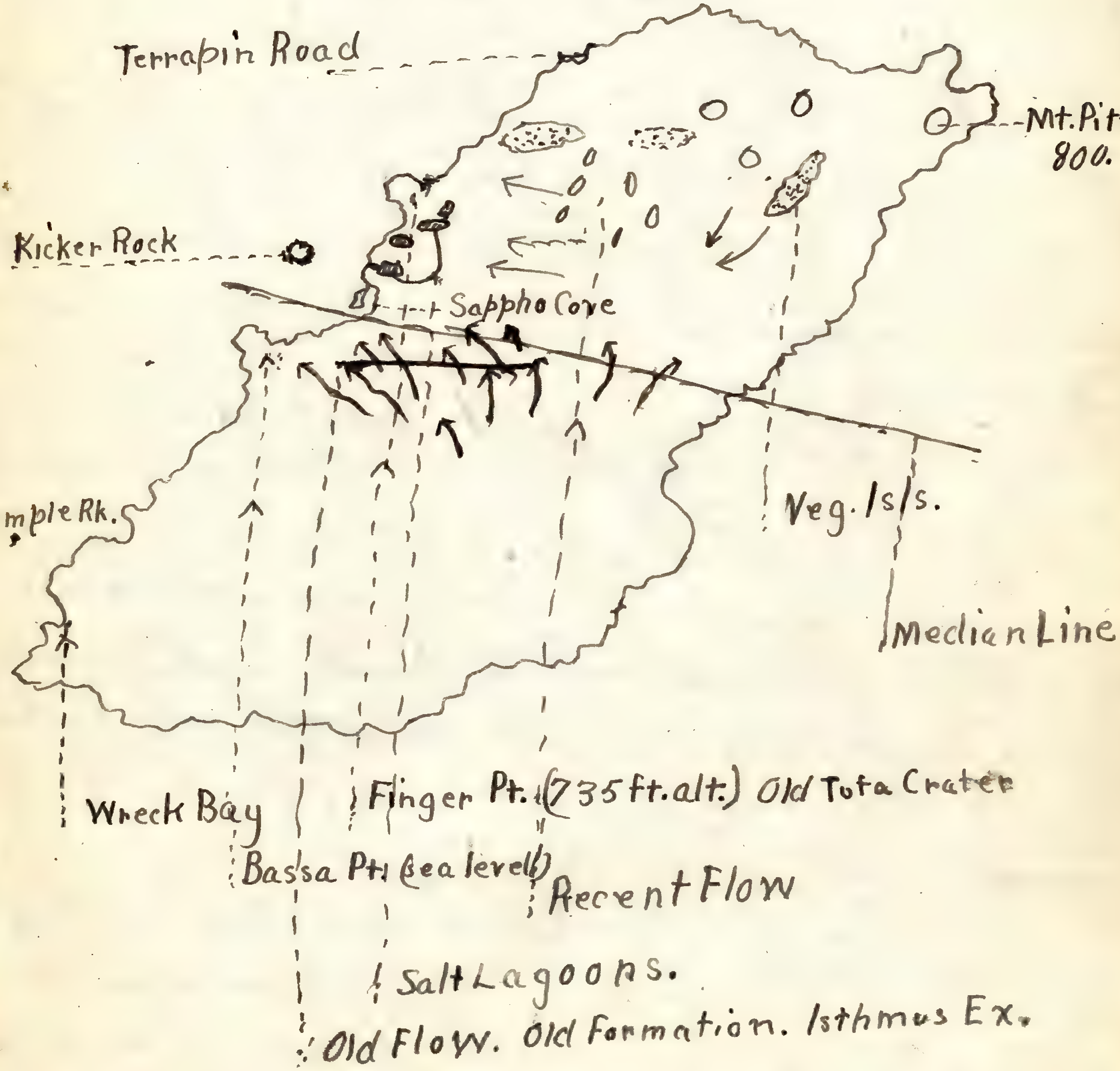

Terrapin Road
Mt. Pitt. 800.
Kicker Rock
Sappho Cove
Dalrymple Rk.
Veg. Is/s.
Median Line
Wreck Bay
Finger Pt. (735 ft. alt.) Old Tufa Crater
Bassa Pt. (sea level)
Recent Flow
Salt Lagoons.
Old Flow. Old Formation. Isthmus Ex.

Fig. 16

This figure is meant to represent the important relation of

1. The relative ~~[illegible]~~ age of lava flows...
2. North end of island to Southern ~~half~~ portion, the median line dividing into relative parts.
3. Finge Pt. & the rest of the island.
4. The low part, or isthmus of island to the north & south portions.

A study of Finger Pt. & its surroundings reveals an interesting condition in the structural formation ~~of~~ this N. portion of the island. The point itself is an old crater, composed of the sand stone like tufa. (shown in specimen No. 52) The interior is well broken down & form a good soil in which generations of hard wood trees have come & gone. The old tree trunks stand & are reclining everywhere. Only three ~~[illegible]~~ cactus plants are present.

On all sides the great mass drops off in almost perpendicular cliffs. ~~On the~~ Nearly one half the total circumference of the mass is beaten by the surf, ~~that the~~ toward the west. The eastern half fronts the wide lava fields of recent flow.

~~The flow has its origin~~

Chatham

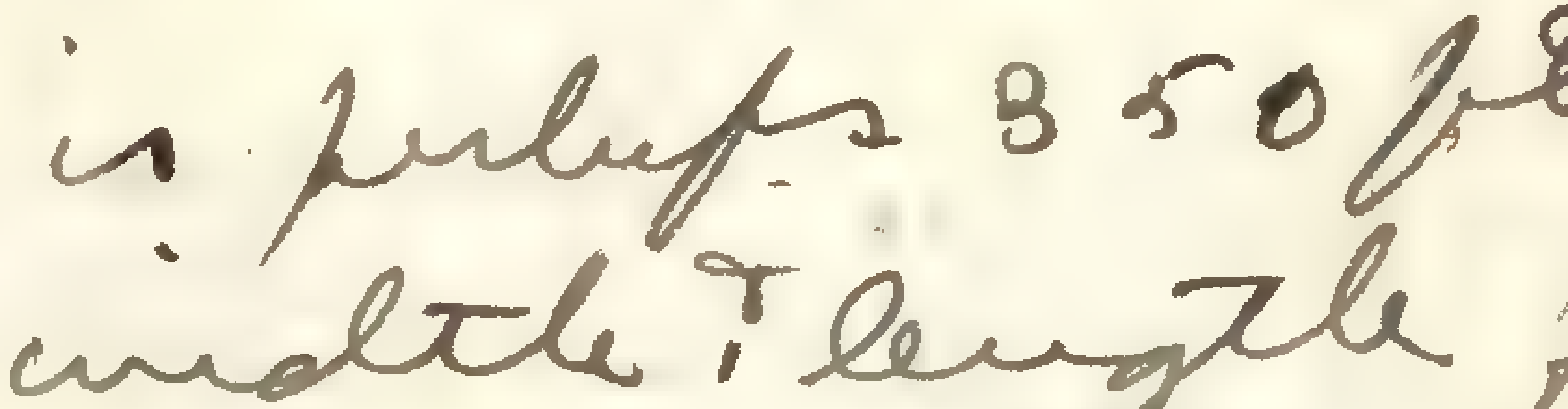
At the base of the great truncated cone, with its broken edges, are a number of salt lagoons: shown in the figure.

The lagoons show the former position of the sea. This is ~~fo~~ proven by the old hardened ~~sand~~ coastal sand which makes a frequent shelving shale like outcrop along the coast from Sapphire Cove to Finger Rock. The fact that ocean waters circulated freely at the eastward side of the cone is ~~suff~~ still further shown by the ramifying tendency of the termination of the lava flow thus cutting up the ~~coastal~~ old coast into small basins & depressions. The nearer ones to the coast being on a level with the ocean. ~~Thus it is apparent that the recent lava flow having its origin in~~ The lava flow itself is extremely recent, certainly within the last half century. The rock is the dark grayish, vesicular basaltic ~~de~~ nature. The flow has it's origin in a series of small cones ~~about~~ varying from 200 – 500 ft in height, having a bearing of E. & N.E. from Finger Rock. ~~otherwise~~ further shown in the fig: This series of cones is backed up by higher cones ~~about~~ 4 in number. The highest being Mt. Pitt 2000 ft. at the extreme east end. The flows of have the direction indicated by the arrows.

An examination again of the figure shows a tendency of lava flow to go in a general N.W.; N.; & N.E. direction from the high elevations of the older south portion. Now the meeting of the two flows, that from the north portion & that from the southern elevations has ~~was~~ built up the low ~~set~~ region, to form an isthmus ~~between~~ connecting the North portion with the south.

This isthmus formation occupies the narrowest ~~p~~ width of the island another proof of isthmus nature. Its greatest altitude is perhaps 350 ft.
(Determine ~~width~~ width & length from the chart.)

The cross section from E. & W. would be much like this



1.) The old cone Finger Rock must have a fuller description.
2.) Elaborate a little more on its island history
3.) The isolation of life will assist in insular demonstration.
4.) Bring in old beach & subsidence.

James Island.

Fig. 13.

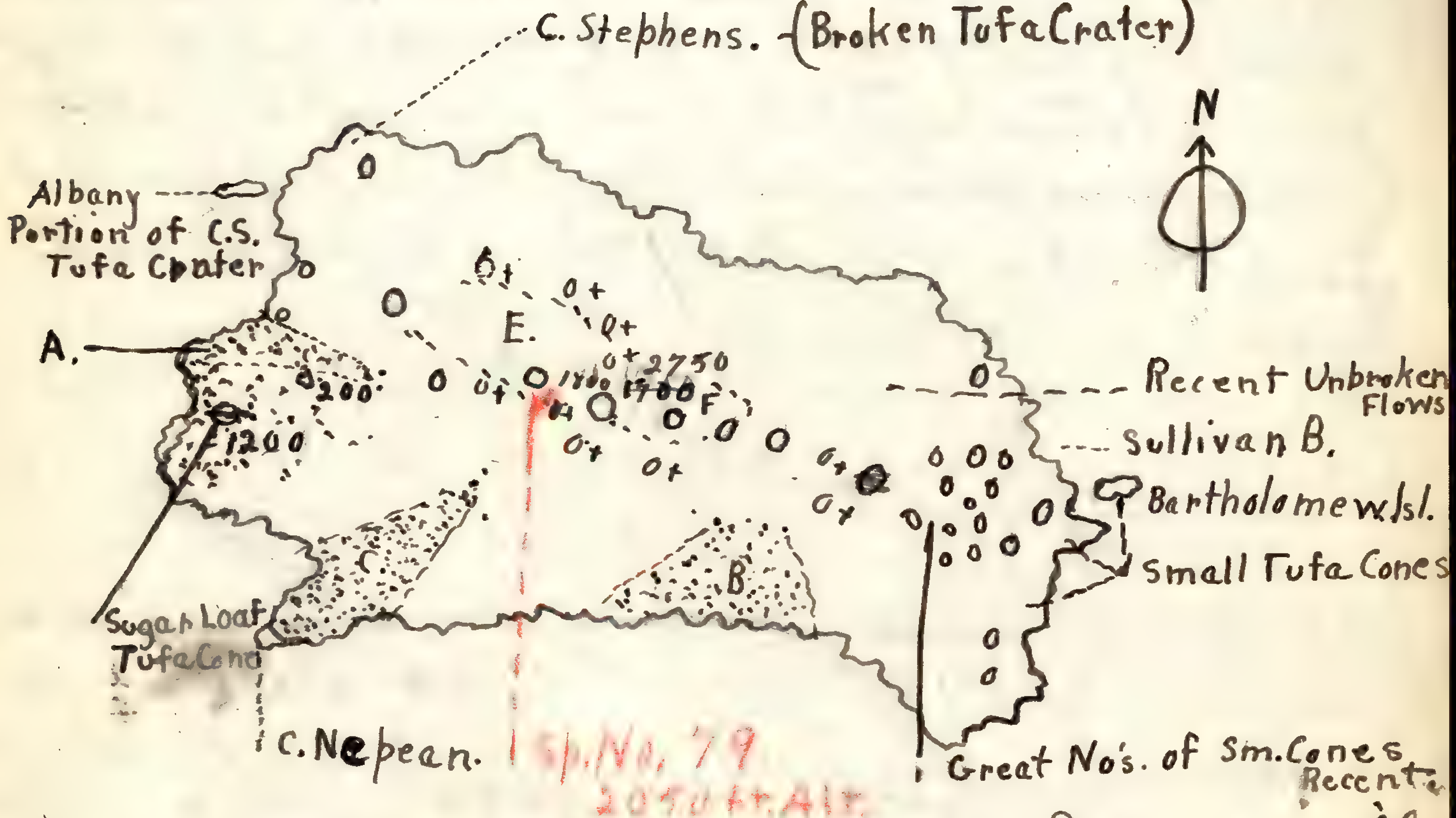

C. Stephens. (Broken Tufa Crater)
N
Albany
Portion of C.S. Tufa Crater
A.
E.
2750
1700
F
200
1200
B
C
Recent Unbroken Flows
Sullivan B.
Bartholomew Isl.
Small Tufa Cones
Sugar Loaf Tufa Cone
C. Nepean.
Sp. No. 79
2050 ft. Alt.
Great No's. of Sm. Cones Recent

Fig. 13. a general outline map of James will be used to illustrate the position of the diff. phases of the topography & surface geology. "A", "B", & "C" are distinguishable lava flows. "B" is described in Fig. 10. "C" has not been visited. The flow "A" was visited & proved of especial interest. The flow has its origin in the small craters or blow holes, indicated by dots at the apex of the triangle, and had its line of flow in an unobstructed stream to the coast, forming the present S. ~~boundary~~ slope of James Bay. The total length of the field is about $2\frac{1}{2}$ miles. About midway between the coast & the craters, where the ∠ of flow ~~was~~ became steeper the flow is rather broken, but from this midway point to the coast the flow is very smooth & broken only by the customary fissures. These fissures had a sort of reddish, salt like deposit along the crevice ~~showing~~ evidence that some mineral or gaseous vapor was deposited when the exit became possible. A few chips of this light colored deposit were taken – possibly they may show the presence of Cl., thus indicating that the exciting vapor was derived from the ocean.

About $\frac{3}{4}$ of a mile from the coast is the elevation marked alt. 200. This is a complete circle, a cone the given height, nearly $\frac{1}{4}$ mile in diameter, the walls rising to a sharp edge on all sides (are of the sand-stone like tufa.) and at the bottom about 200 ft thick. ~~Pitting~~ the whole bottom of the crater is filled by a salt lake. The presence of the salt lake shows the subterranean connection of this region & the ocean, thus an evidence that the ocean furnished the vapor to excite the explosion.

Again: the presence of this water & the proof that the ocean is in connection may indicate that there has been a slight subsidence making the advent of the ocean water possible – thus the reason why there have been so many small lava flows along the lower levels of the island.

Only a few rods inland from the shore nearly the middle of the flow stands a small, old, broken down crater. Its ~~rock~~ structure & ~~[illegible]~~ relation to the lava flow indicates that it was there when the flow came down.

Fig. 14.

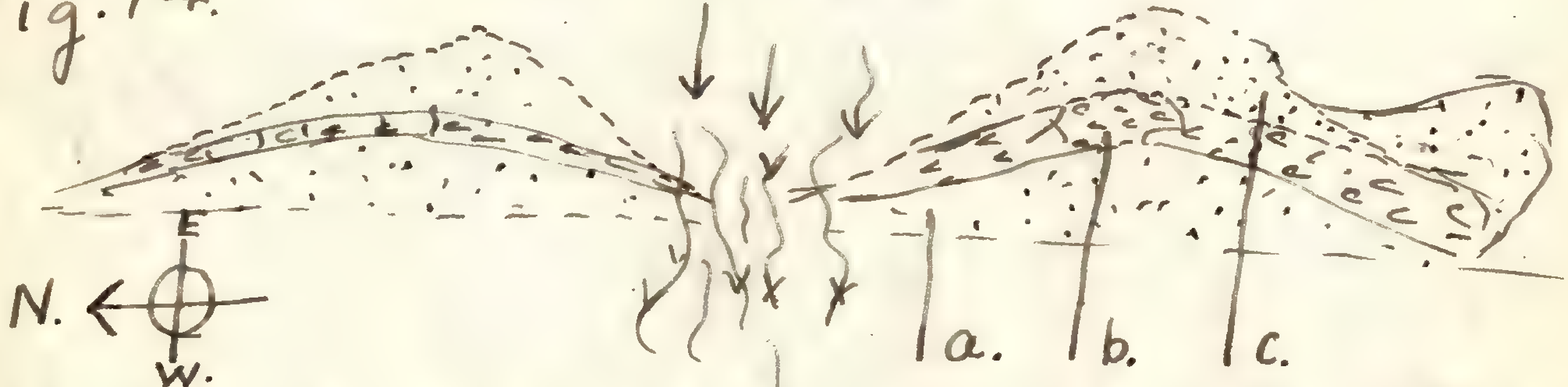


Fig. 14 illustrating the general structure of this old crater. "a" is the red, granular, porous, cinder, like lava. Some of it has fallen in great chunks. ~~Its~~ Under the picks the blocks seems composed of the small granules of this red material rather weakly cemented together. Some small chips were taken as specimens & accompany No. 39. in the specimen list

F – ~~It should~~ The W. face of the crater was completely broken down to form a shear cliff presenting the structure here indicated.

"b" is a definite layer form of lava. some 4 ft thick which occupies the position indicated. Specimen No. 39 is from this formation.

"c" is the same structure as "a". In all the extreme height is about 35 ft.

When the lava stream reached the ocean the cooling effect of the water caused the ~~the~~ stoppage & thus formed perpendicular cliffs. This is important in determining the relation of flow to subsidence.

Comparing the flow to that one of known age on the S. coast Fig. 10. this one is about 20-25 yrs. old.

Near the small craters at the head of the flow are a few patches of recent emission like that described in Fig. 18

Jan. 2-3-4, 1906

Aside from the shell work, a fine opportunity was obtained of seeing the general topography of James. The general features have been added in the outline map. In addition to the little circles marked "+", I have indicated the two basin like areas "E" & "F." as nearly as may be determined in this advance state of break down & vegetation. These two areas form the basins of the two principal craters. ~~It~~ Viewed from the top the ~~area~~ country to the S. is rather well dotted with craters & in general the S.E. by N.W. trend of the craters was emphasized.

Important considerations.

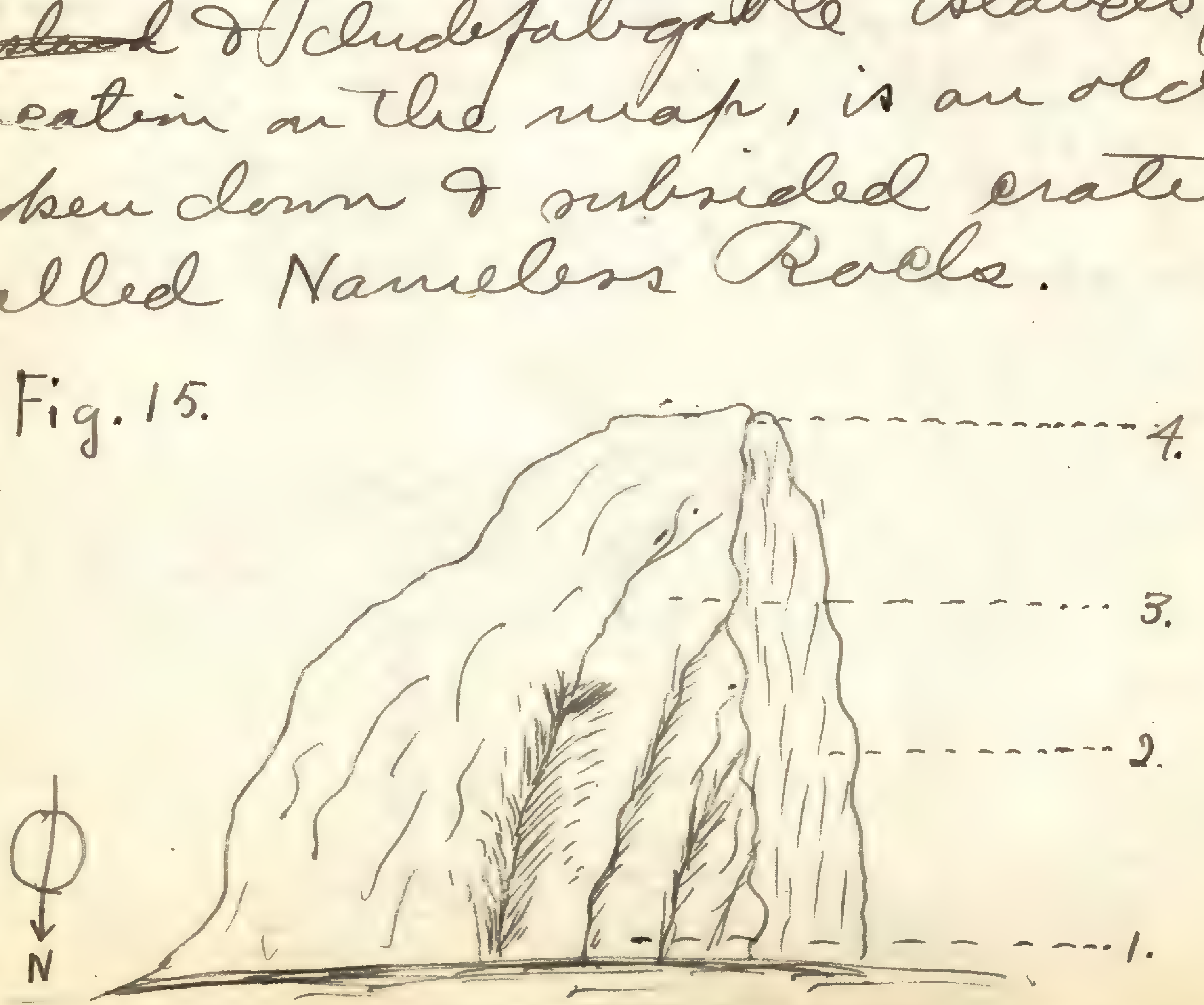
From the evidence at hand the effort should be made to prove that James is ~~one of the~~

1. One of the younger of the islands.
2. That the trend of the craters is in a S.E. & N.W. direction.
3. That it has an important relation with the present distribution of the vegetation.

Nameless Rock

Nearly midway between Duncan ~~Island~~ & Indefatigable islands (see location on the map, is an old broken down & subsided crater called Nameless Rock.

Fig. 15.



1. Reddish, sandstone like tufa is exposed at the level of ocean erosion
2. The sheer wall of the inside of crater showing the line of fracture
3. Brown weathered surface.
4. Sharp summit, about 300 ft. high.

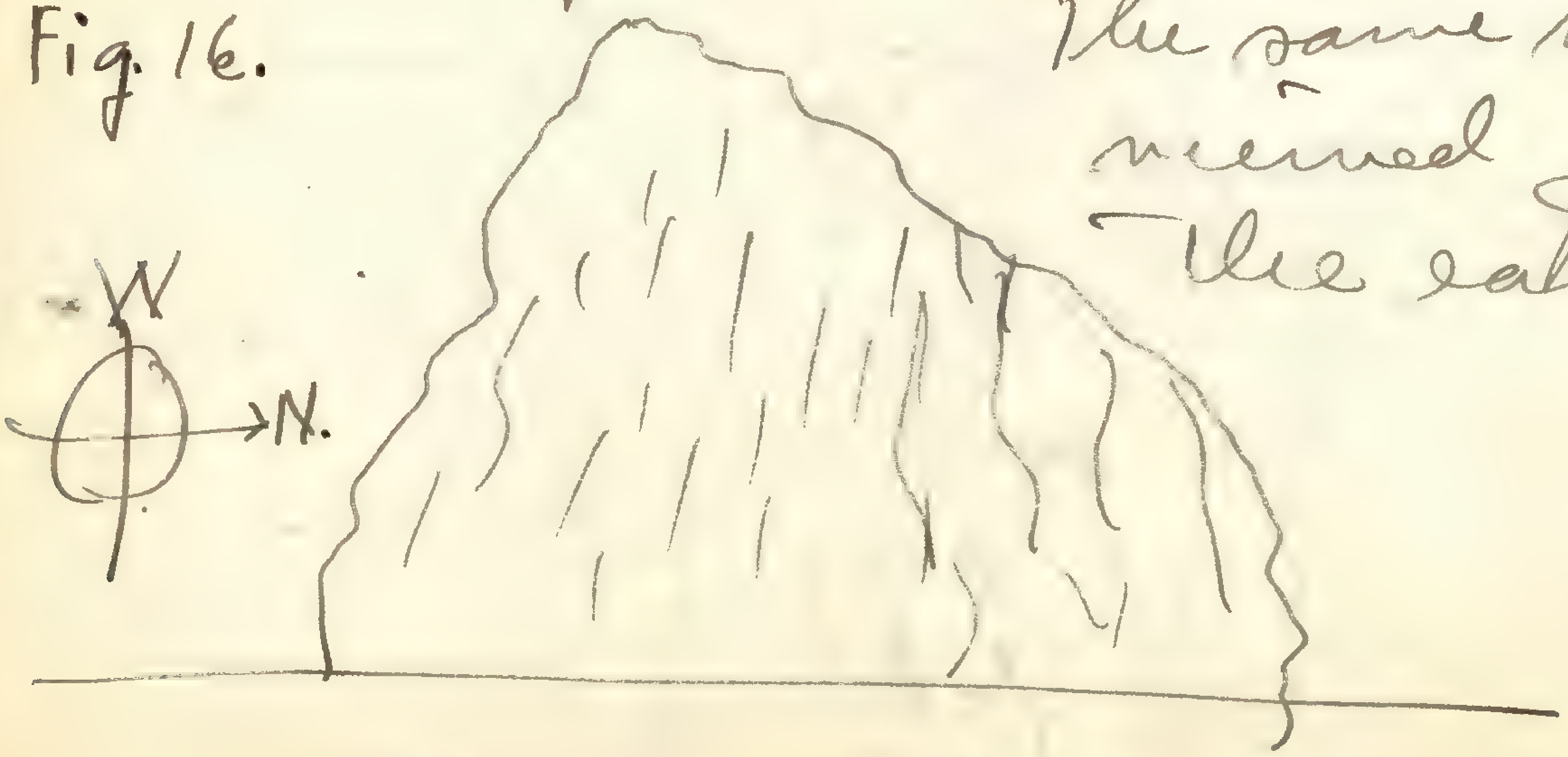
The rock could not be visited, but was viewed from the ship close in.

The base is perhaps 400 ft. across in the line of vision drawn

The direction of the lines of surface erosion are important in indicating the magnitude & form of ~~body of~~ the former unbroken mass. These lines indicate a crater formation considerably larger than the present mass.

That the rock is a survival of a phenomena of subsidance is evident.

Fig. 16.



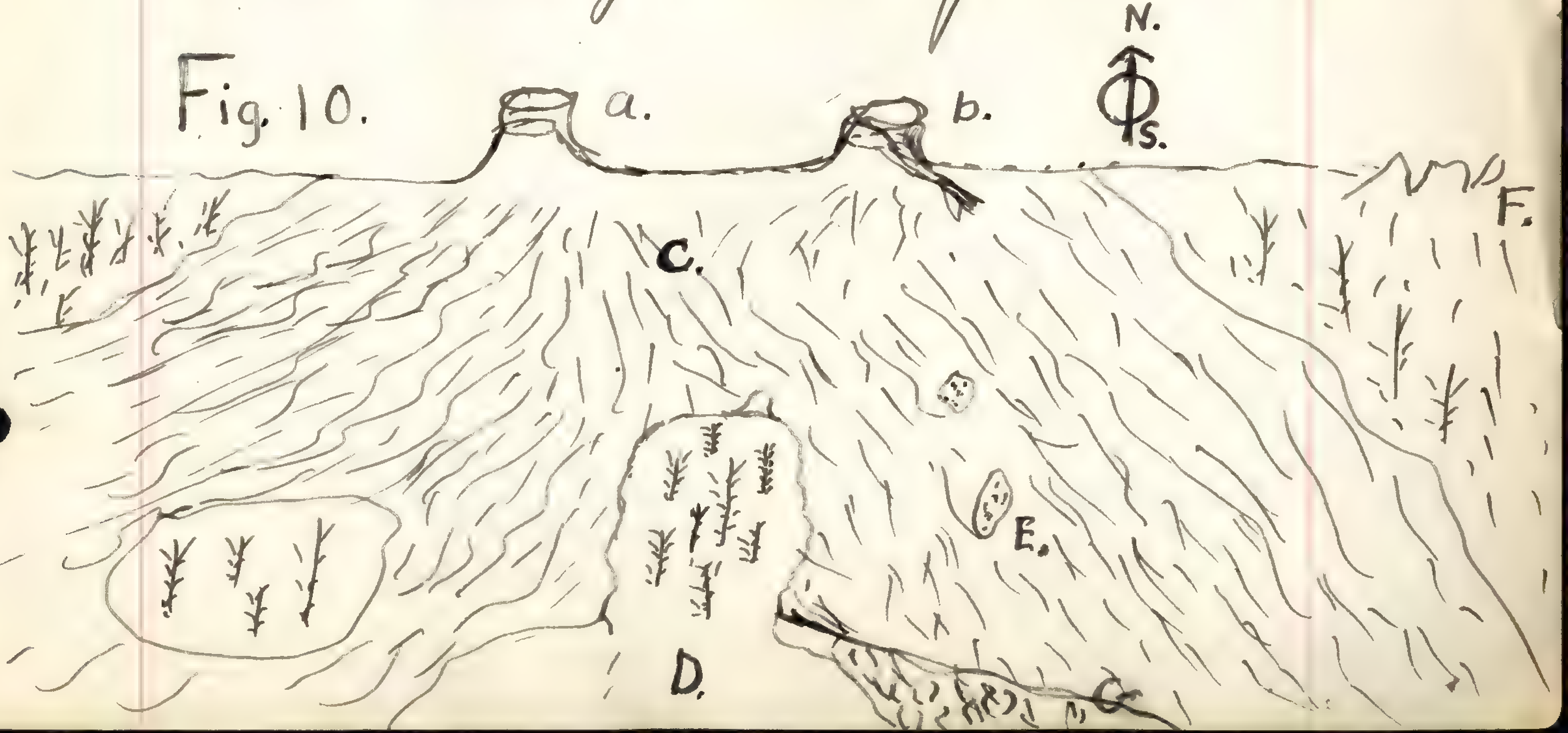
The same rock viewed from the east.

James Island

Dec. 19, 1905.

The two small craters on the S. side which were reported active at the time of ~~the~~ Beck's last visit, 1901. The craters seemed nearly half way up to the gen. top, that is where the higher peaks begin to lift their heads, thus the craters are probably at about 600 ft. alt. From several miles off shore the black lava fields ramifying through the small brush growth & its margin with the brush growth above, were easily seen. In some places the lava river flowed about the bush leaving isolated & completely surrounded islands of thin brush which stand out gray in the background of black lava.

Fig. 10.



97. "A" & "B". The two craters "B" broken out on the S.E. side

"C" The recent, light, cinder ~~lava~~ much broken lava

"D" Large bush grown island, a former 98 flow.

"E". Other small islets.

"F." Brush on the east side, same age of lava flow as "D" area

"G" Lava flow same age as "F." & "D" area's

Landing at "G" we advanced inland. The first area "G" is an old flow, quite level, the lava having flowed quite easily over this level lowland, ~~[illegible]~~ it solidified quite slowly leaving a rather even surface broken only by the great fractures after cooling & for the escape of gases & vapors. After going some ½ mile inland the lava is slightly grown over by cacti & small bushes. This lava field was quite easily passable. In some places the flow illustrated the tunnel formation. In these particular places the flow had a ~~viscid~~ wrinkled, corrugated surface, ~~[illegible]~~ with something of a wax like finish of glassy obsidian. This

James

surface formed a crust varying ~~between~~ from 1 & 4 inches thick, which blanketed the flow beneath leaving it to flow along in it's channel thus forming tunnels. For the most part the tunnels were a small diameter, 2-3 ft. due to the loss of heat reducing the flow activity.

After passing through "D" ~~H~~. in a direct line for crater "b." one comes abruptly ~~to~~ to the new flow "C." Where ~~it in~~ "C" meets "D" it forms a great slag pile like barrier some 15 ft. thick. Climbing up on this & looking toward the crater one sees a great field of loose, much broken, exceedingly sharp cutting blocks of extremely light porous cinder like lava. The scene is one of desolation & the field proved an almost impassible barrier. Mr. Beeds succeeded in forcing a passage & visited the crater "b". He reports the interior to be a great hole which ran down into an absolute blackness. The crater was perfectly ~~quiet~~ quiet.

99. He reports that just next the crater is a salt like deposit of white crystalline matter. These white patches were visible from the margin of "D" & unfortunately Mr. Beck did not bring any specimens of it.

95 A notable feature is the fact that the crater is broken down on the S. E. side & a large fissure ~~runs~~ continues in this direction for some distance. (Another relation to Darwin's idea of S.E. opening due to sub-marine origin.)

Another remarkable feature ~~is the fact~~ is the great flow of recent lava forming these islands & yet the vegetation in the immediate locality is unscathed. It is easy to understand that after the light extremely ~~[illegible]~~ porous cinders lost their heat & they must have done so very rapidly, they were pushed forward and formed ~~banks~~ ~~lateral~~ debris banks much like the lateral moraines of the similarly slow-moving glacier, by the slow stream of lava. At these places where the black lava flow itself came close to the vegetation, its great heat radiation was prevented by the rapidly cooled lava shells on the surface.

The areas "G" & "D" & "F" are flows of a much more compact lava than the field "D". It approaches almost the true & common form of basalt. This is interesting regarding the nature of the flow which comes at the close of volcanic activity.

The crater has evidently finished its life — the great bottomless hole — absolute quiet after so recent a flow; thus conjectures as to the material at the close are quite in line.

Good specimens of both the older & newer flows were taken. Also good pictures illustrating formation etc.

Where the lava flow met the ocean there was little marked diff. except perhaps a greater tendency

toward a glassy surface, a formation of thin obsidian caused by the sudden cooling of the lava flow.
Another tendency seemed that a general break up ~~into~~ & splitting of the stream flow.

It was important also, as an observation on subsidence, that at the shore the lava was broken off or ended abruptly to form a bank like shore line ~~beach~~ ~~[illegible]~~ 8-12 ft high. This indicates that in these places where the lava slopes gradually into the ocean or the ocean has encroached upon the region of lava flow that it is an area of subsidence. Again the sudden cooling of the terminal lava incident to it's reaching the ocean would prevent any extensive further flow & would tend to form the kind of shore line observed here.

James.

Aug. 1-06

Visited the E. & N.E. sides of the island at & N. of Sulivan Bay. The bay is formed by a cluster of great tufa cones; about 300-350 fts in alt, and afterwards joined by recent flows of light, vesicular, basaltic character.

Back of Sulivan Bay & in the country to the N. of it is a great area covered by innumerable small cones of recent action. (The area is indicated in the Fig. 13.)

When one views the intervening ocean which seperates James from Seymour & Indefatigable, with the ~~islets~~ two Daphne islands standing midway, it does not require any great stretch of the imagination or of reasonable assumption to feel that these islands are indeed closely related, and that no profound subsidence is needed to separate the one large island into the two smaller.

Aug. 7-8, '06. James Bay.

Made the important discovery that a portion of the middle N.W. half of the great median range of craters is composed of Tufa. Specimen No. 79 is a part of a large tufa ledge exposed to a thickness of about 10'. The specimen was taken about 200 vertical feet from the summit of the ridge and at an altitude of 2050'. The parent mass had a just perceptible dip to the N.W.

Just what this tufa deposit will show is a little difficult to determine off hand. From the color & texture of the specimen it may be shown that it is the consolidated remains of an old pumice deposit. The exposed ledge gave no indication of a conglomerate nature. & above top of the ridge seemed composed of a light clay soil overlying the tufa.

The pumice deposit theory seems reasonable now from the proximity of the great fields on the E. side of Cowley Mt.

Jervis Island.

Dec. 20, 1905.

Jervis is a small roughly circular island, having a length of 1¼ miles along its greatest diameter. The surface is covered with a loose lava blocks of the basaltic character but very scoraceous. From east to west is a series of three elevations. The middle elevation with an altitude of 1000 ft. is slightly the highest ~~than the other~~.

Fig. 11

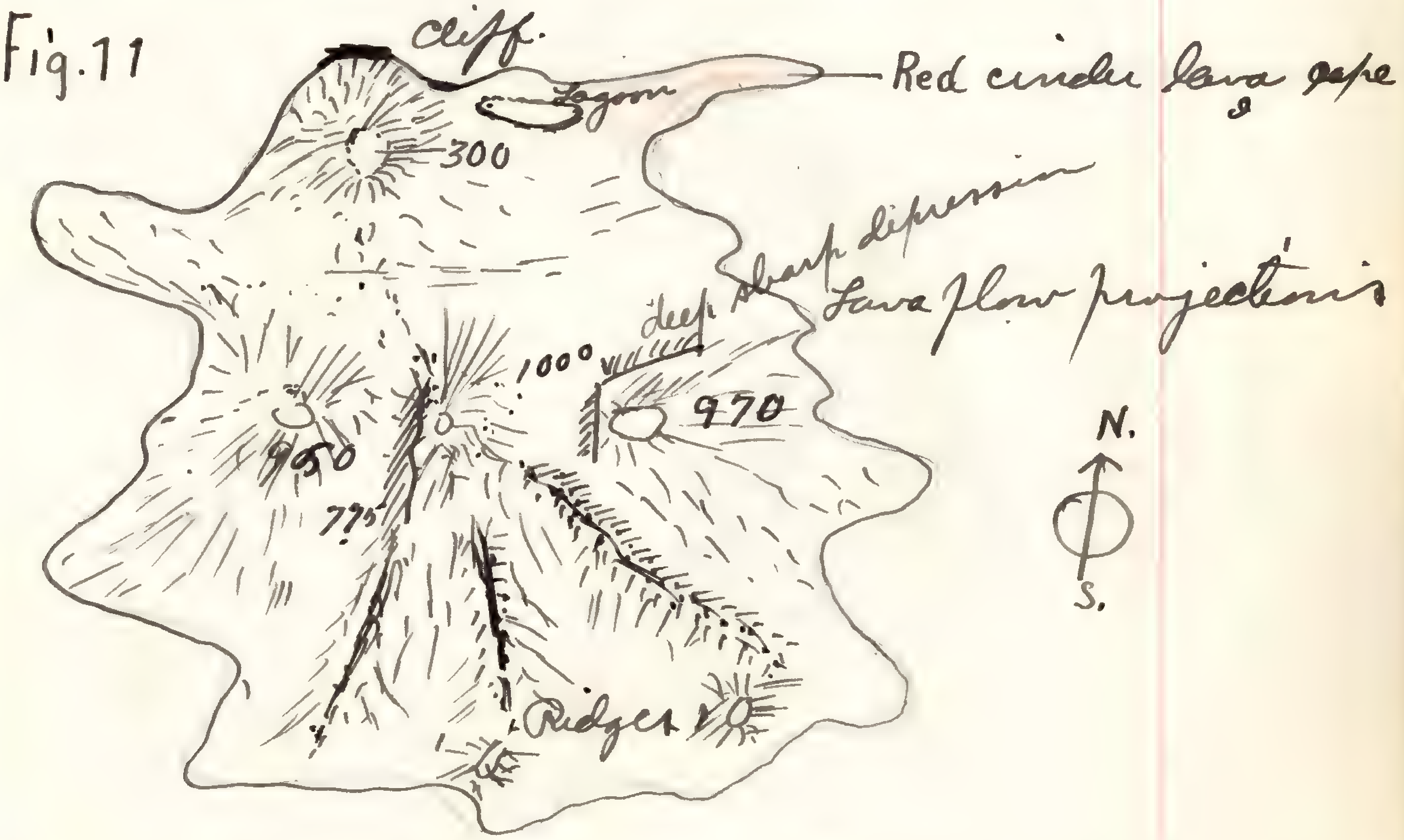

cliff
Lagoon
Red cinder lava cape
300
deep sharp depression
Lava flow projections
1000
970
950
775?
N.
S.
Ridges

Fig. 11 shows the general surface relief. (Fig will be corrected in contour when drawn from chart.) The 300 ft. elevation of the north is a ~~much broken~~ great heap

105

of finely broken lava cinders. Its foundational build is exhibited in the sea cliff where the north promontory has been broken down by the surface, thus forming a perpendicular cliff some ~~100~~ 60 ft. high. The structure is that of a light, red, exceedingly porous lava flow, in composition, structure etc. the same as the specimens of the red rocks of Gardner, near Hood, will show. The flow is quite uniform, has a layer like formation similar to a stratified rocks and dips at ~~about~~ 30° or to the N. ~~[illegible]~~ Spattered through the entire mass are a few fragments of a fairly compact basaltic lava. On the brick slope of this 800 ft. elevation one's attention was called by the small boulders of a grayish rock which closely resembled granite. Following this up a great number of granitic blocks were discovered, some lying loose on the cinder cone, others imbedded & somewhat enclosed by a flow of ~~to~~ dark lava in texture much like the red cinders just described. Study of the occurrence of the granitic blocks with their surroundings seemed to indicate that they were thrown up here at the time of

Jervis

the eruption. Their [illegible] imbedded & lava encircled position is further suggestive of this idea. Good & plenty ful specimens were taken.

With the possibility that this may be proven to be granite comes an important consideration. It would seem that the granite is an relic of a once metamorphosed continental shelf or area.

!! This consideration is important & should be one of the first to be determined. !!

The red cinder lava formation has an eastern projection in the cape marked in the fig.

~~As nearly~~ The old crater had its position in the depression indicated to the S. of the 3 high points. Some few pieces of the white fused marble like rocks were taken from this locality too.

The high points marked were quite sharp at their summits. The one to the W. of the highest point was separated from ~~it~~ the latter by a deep fracture in the rock top. ~~It is found~~ The

elevation of this rupture is given. ~~It's~~ The
E. side of the depression is an almost an abrupt
drop extending ~~also~~ quite to the summit
of the 1000 ft. elevation. On it's W. side it
slopes with ~~the general~~ slightly sharper slope than
the general one of the island to the 950 ~~ft~~ elevation.

(Determine from the known height, & known
distance what this ∠ of slope really is.)

~~Though the the~~ two wester points: the highest &
the ne west, are covered with a light dust
having scattered rather plentyfully over
the surface the loose lava blocks. These
blocks become more numerous as we descend
toward the bottom of the elevation. The
eastern el[illegible] elevation has a crown ~~F~~
of the stratum like ~~lava~~ cinder flowage. This
~~structure~~ seems to prevail though the
greater part of its height, at least it ~~was~~
observable ~~down~~ to a depth of 300 ft. from
the summit where the formation was
laid bare on the N. side by the "deep
sharp depression" marked in the fig.
It's ∠ of flowage is 23° & ~~also~~ toward
the N.

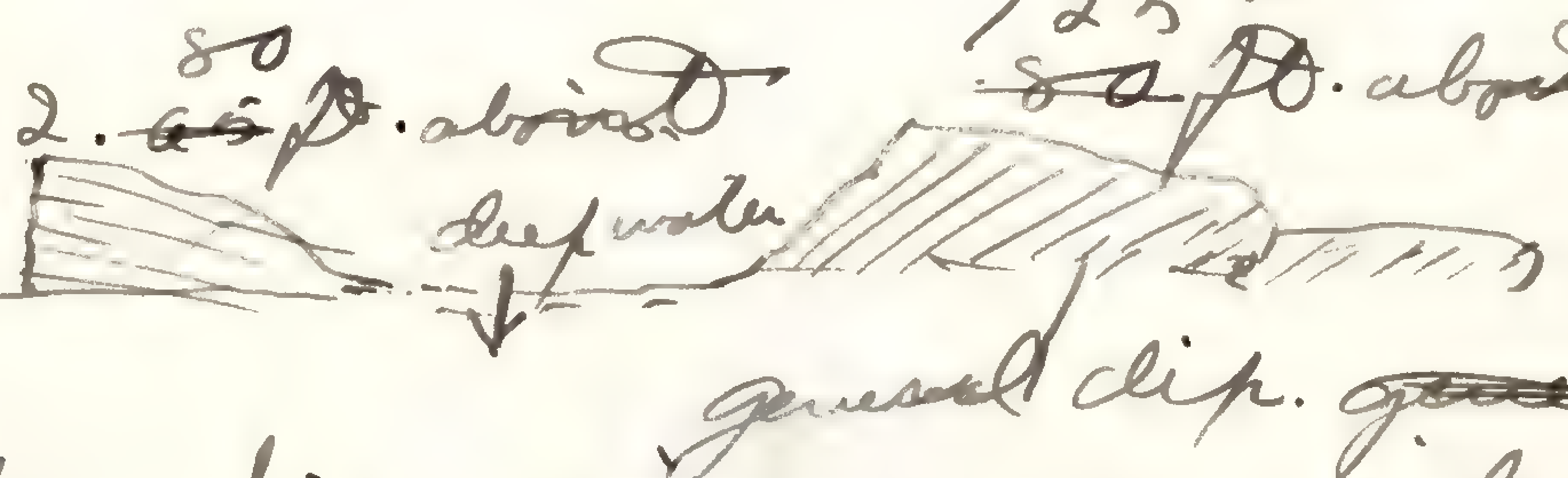
The very considerable height of Jervis,
the ∠s of flowage, & the ~~for~~ indented

Jervis

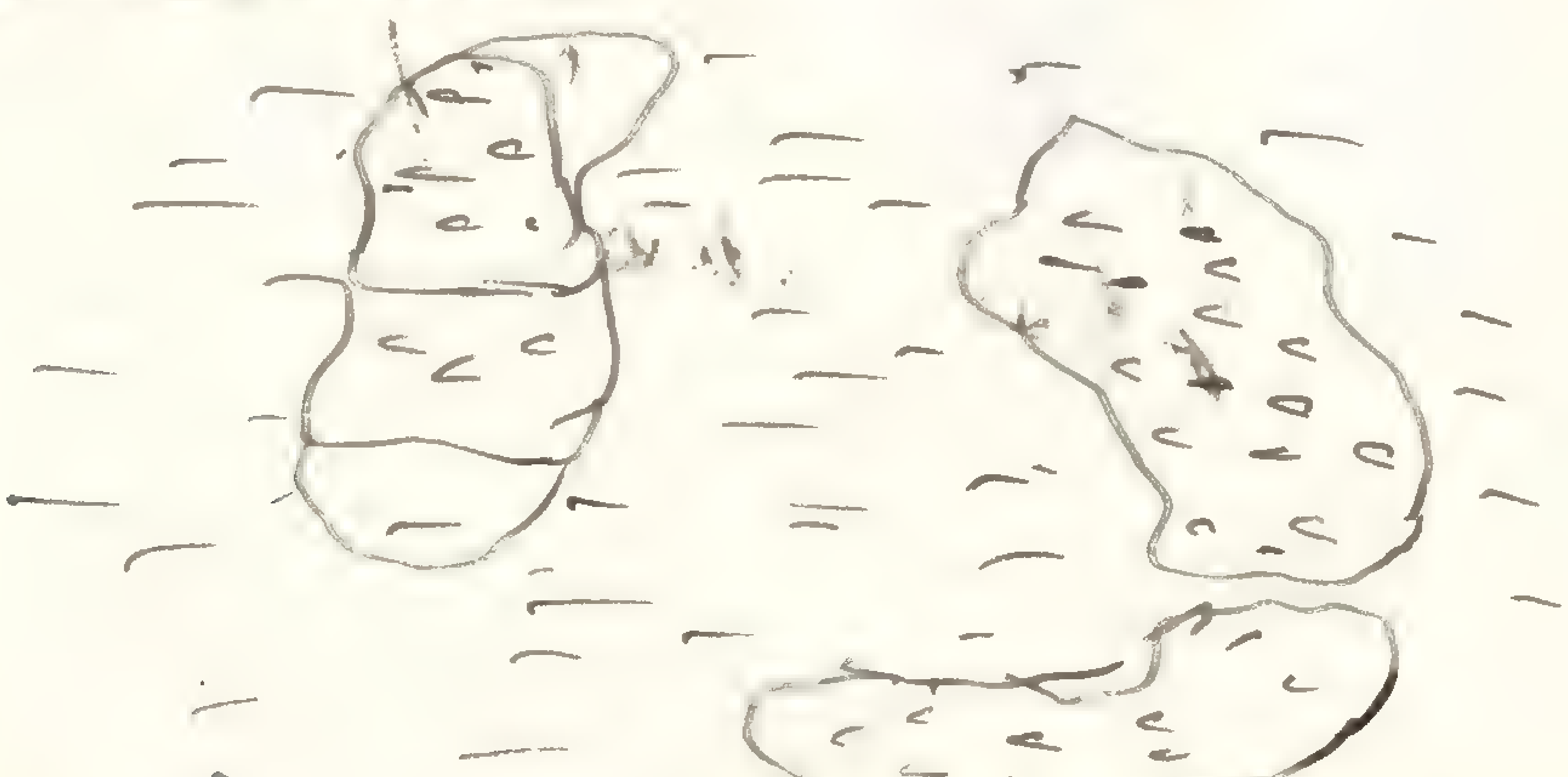
character of the coast indicates that the great field upon which the lava flowed is now beneath the ocean — thus a ~~region~~ of subsidance (Develope !!)

On the way to Jervis we sailed through the crater of a small volcano. Its location is marked on the map as three dots to the E. of Jervis.

Fig. 12.


~~65~~ 80 ft. about
~~80~~ 125 ft. about
deep water
general dip. ~~general~~

The above fig. gives some idea of the general formation & the direction of dip. The rocks ~~was~~ seemed a tufa like structure, the color of sandstone.



Something as it would look from above. The region is

109 unquestionably one of subsidance. It's bearing then on the general idea is one links in a chain.

Seymore Islands.

Nov. 21, 1905

Seymore South

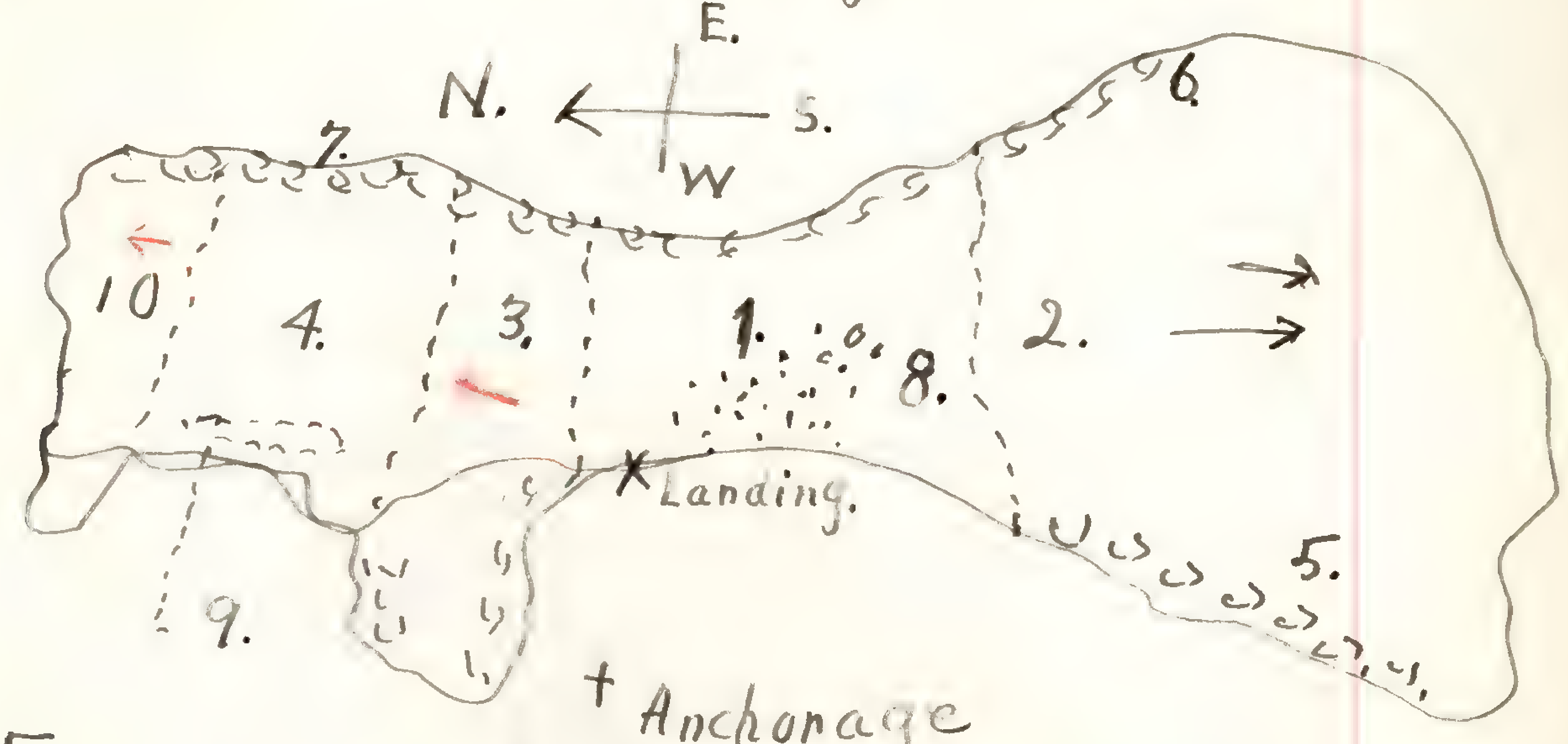


Fig. 3.

Fig 3. shows the general outline of Seymore island. No. 1. is a depression between the two terraces "2" & "3". It is about 1½ miles long by 1 mile wide. Almost the whole surface is covered with a soft red dust, the result of the breakdown of the rocks (of which a specimen is taken & will be described) Scattered over the ground are patches of great rounded reddish boulders, becoming more abundant ~~as we ads~~ toward the E. Beginning at the landing at sea level the area gradually rises toward the E. where its sea wall is perhaps 80 ft sheer. No. 8." the dots represents the occurrence of fossils. In this area ~~represented by the~~ the attention is taken to small patches of a ~~loose~~, grayish, angular rock, lying loose in small fragments scattered over the red sand. These fragments contain fossils, most of them so weathered that they are of little value. Collected some 20 specimens among them being two or three fine specimen of bivalves, & two Turritella like forms, very much like Hoffmani.

No. 2. is a terrace or plateau like area rising about 50 ft. above ~~the~~ No. "1." & sloping in the direction of the ~~area~~ arrows. at the line where is ~~arises~~ above "1" it is extremely rough, covered & stacked with great lava boulders having a reddish surface. Toward the S. the direction of the arrows it soon loses its rough surface, becomes smooth. the surface is the soft red dust of area No. "1." Before attaining its full height it is broken by a single terrace about mid way up. at one point this break has the form of a shelf some 30 ~~20~~ ft. wide.

No. 3. is a low, stony plateau similar

to No. 2. Its surface is quite level & ~~co~~ covered with the same reddish boulders of No. 2.

No. 4. is another depression similar to No. 1. To the W. it slopes to the ocean & forms a depression for a small lagoon, No. 9. It rises to the E. much more rapidly thus its sea cliff is higher. Just at the top of this cliff is exposed the white compact, metamorphosed old beach sand; identical in texture & fossils with the "A" of Fig. 2. & that described in Fig. 1.

No. 5. is the abrupt sea wall of area No. 2. sloping gradually to the ocean on the S.W. in one direction & forming the prolongation of the rise of No. 2. above No. 1.

The island is especially interesting in this alternate depression & rise. The fracture which severed this island from the main island tipped the area No. 2. breaking its connection with No. 1. at ~~some~~ a point of weakness, & allowed No. 1. to sink.

When No.1. reached the level of the ocean the violent erosion wore away the "B" stratum (the loose fossils are exactly the same as B. of Fig. 2) to leave its fossils scattered over the ground. Area No. 3. held itself above somewhat due to it's structure.

Area No. 3. is some lower than No. 2. & quite level

No. 10 is another plateau or ridge having a sharp break off at the point where it is severed from N. Seymore.

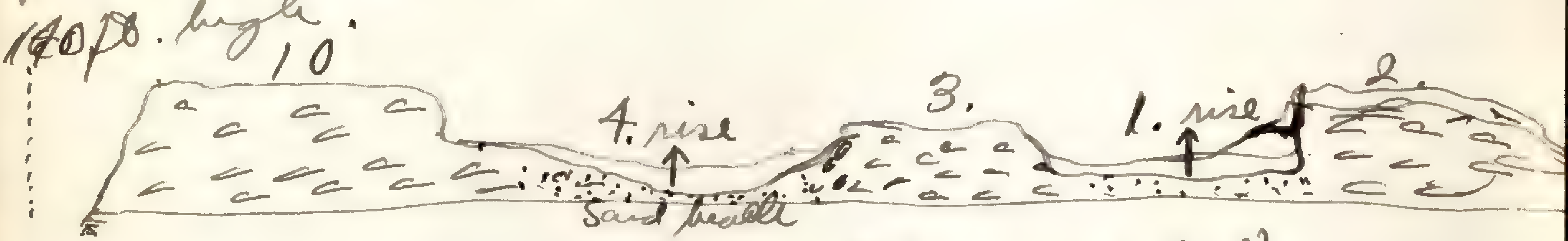


Fig. 4.

(somewhat exaggerated)

Fig. 4 illustrates a profile view of S. Seymore This serves to illustrate the general arrangement of the three plateau like terraces & the two areas of subsidence - perhaps they are permanent subsidences occurring with the formation of the other cliffs.

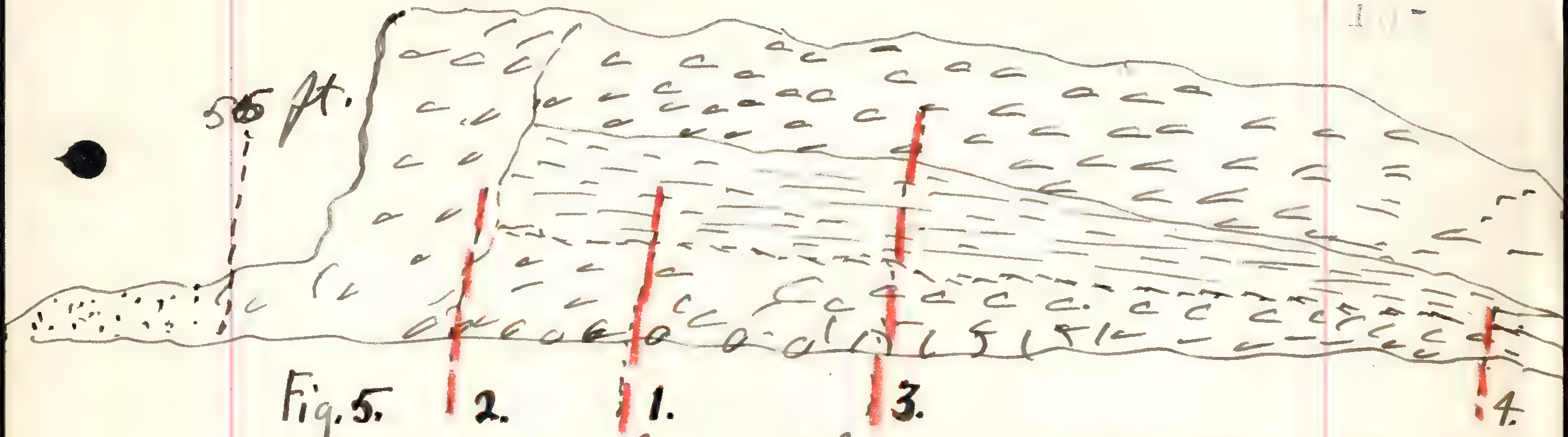


Fig. 5.

This fig. shows the general structure of the cliffs marked "5" in fig. 3.

"1" is a fine fossiliferous bed. The matrix is a somewhat hardened sea beach of coral & shell sand finely filled.

"2" is ~~a~~ an somewhat overwhelming mass of lava flow which obstructs the outcrop of the "deposit" (fossiliferous)

"3" is the lava flow which caps it all.

The general heights: from ocean to lower edge of fossiliferous strata is about 4½ ft. ~~high~~, then the stratum varies between 8 to 10 ft. thick & there bears off abruptly to the solid mass of dark graystone lava flow, some 12-15 ft. thick which caps it all & preserves the fossils. This great mass of lava is completely compact — no vesicles. of a pretty crystalline structure; & ~~also~~ the few fractures

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only serve to crack the great mass into blocks some 10 or 12 ft. square, many of which have fallen into the sea & formed a protective talus - to keep back its encroachments up the soft upper cliffs.

The deposit bed has a rather uniform dip of ~~*~~° 12° It gradually becomes much thinner where it loses itself in the sea at "4".

Fig. 6.

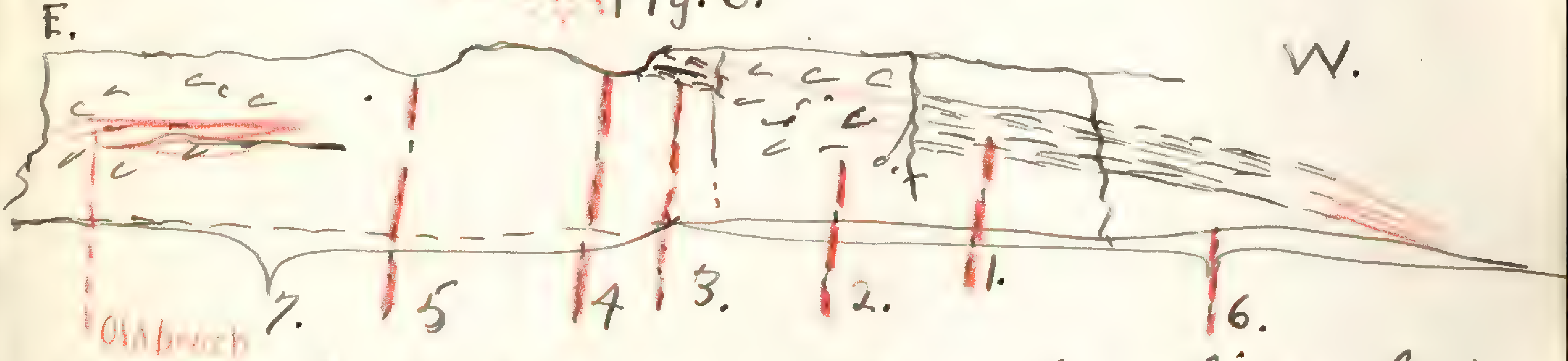


Fig. 6. Illustrates a eastward continuation of the cliff of the preceding fig.
"1" is the same fossiliferous bed.
"2" an igneous overflow.
"3" a continuation of "1" which is here almost ~~at~~ wiped out
"4" is a small stream bed, found only in wet seasons, which bed has taken advantage of the rupture & flows there.
"5" a stream bed some distance ½ mile to the eastward at which place some fragments of very perfectly altered

sedimentary deposit were found.
"6" the ocean.
"7." The land
Distances: "7" 1 mile: "6" 1½ miles.
~~the~~ Height of terrace - as already given
65 ft. becoming less to the westward.

The general dip & final outcrop of the old beach deposit agrees ~~in~~ with the general tilting of the areas "1" & "4" of Fig. 3. It explains why the cliffs of the east coast are abrupt & the tilt of the land is gradually to the W.

(Figuring the distance across the island as 1 mile & the E. cliffs as ~~70~~ 80 ft. high, determine the angle of dip to the W. & from this calculate the dip of the fossil bed.)

The fossil deposit seems the latest of the deposits visited here. The character of the matrix indicates a recent age. The fossils taken were principally Turbos, & Bulla's. The latter being very plenty & found alive here now.

The complete discussion of the deposit

must be suspended until fully collected.

Important Idea.

It appears that there are many species of marine shells common to these islands which are exceedingly similar to those of the West Atlantic. Especially true of large bivalves, Cypraea etc. Large series & a close study of the forms may reveal some striking intergradations.

Also that the shells are much similar to the Gulf of Cal. forms - thus some connection with the Fort Tejon region of paleontology.

The forms here are especially similar to the West Indian forms. - thus a relation to the subsidence of the Isthmus of Panama - indeed the whole S. Central Am. region & the Southern U. S. A.

Seymour.

July, 26, 1906.

Visited again & made a closer study of the fossil deposits & contiguous territory.

The great step like terraces as evidence of the great shocks which cut Seymour from Indefatigable are made the subject of a photo taken from the vessel.

The loose ~~lava~~ fragments of old beach which form the matrix of the few good fossils taken from the low open area opposite the anchorage where photographed.

Mr. King & Mr. Slevin handed me a few good fossils found in this area. Box. 16.

The old beach of which these fossils are a part is probably continuous with the fossil deposit in the cliffs to the westward - but a lower part of it, & probably representing a slightly older period. Where the western margin of area "1", Fig. 3, meets the southern terrace "2" it forms a low level shelf of perhaps 250 sq. ft. in area. About 1.5 ft. above tide level. This shelf is composed of the hard, almost crystalline beach sand identical with the loose fragments

Fig 35.

E. ⟷ W.
Escarpment Wall.
£T
Old beach shelf.
Loose fragments & a few Fossils, - Matrix similar to that lower down
Box, 16.
Fossil Ledge.
Lava Talus.
Small lava Fragments mixed with old beach & Fossil bearing.
(8-10)
(8-10)
(4-8)

The above figure is intended as supplementary to Figs. 5 & 6. with a few added details.

The "old beach shelf" – as sited – is a continuation of the old shelf which once spread over the whole of territory "7 & 8" & being continuous between the

N. & S. escarpments, but after the earth movement which broke this region into its alternate high & low levels it was broken up to allow its fossils to be weathered out

The area marked "loose fragments" etc is a fossil matrix, old-beach rocks ~~marked~~ strewn territory. The shelf or bedded ~~structure~~ of the large blocks is identical with ~~that~~ of the "shelf" and of areas "1" & "8". Like that part of the island top - the surrounding surface is a reddish dusty, thin surface soil strewn with weathered lava blocks. The region thus marked is not extensive - perhaps 300 ft. sea frontage, by 200 ft. depth in S. direction. A few poor fossils were taken - are packed in Box No. 16.

The position of these fragments & fossils considered with the general dips & extent of the more distinct & preserved "fossil ledge" below - indicates that it is the outcrops of the lower or older deposit brought into this exposed position by the tearing, shearing forces of subsidence & re-elevation

The "fossil ledge" proper - that is - that part composed of the clear, white, yellow & red coralline beach sands was observed & vary from 8'-10' in thickness. That it dipped to the westward at about 8° ∠ of decline toward the sea level. Its upper ~~edge~~ part ~~found~~ for a depth of three feet was composed of the clear white beach sand ~~was~~ the characteristic sands of the present sand beaches. The upper margin, of course, for a thickness of about 12"-18" is compactly hard & almost crystalline from the contact with the lava flow.

The "fossil ledge" merges into another distinct strata like structure - the part marked ~~lava~~ "small lava fragments" etc. This layer varies from 4'-8' thick. It is composed of a ~~f~~ rather loose conglomerate of small angular lava fragments & the white beach sand. Most of the fossils - Turbo & Bivalves & Turritella were taken from this part. Though its general thickness is here stated - the lower margin is not plainly discernible but merges into & disappears under the lava talus built up along the base of the cliff. To the westward this layer is less distinct & finally disappears at ~~about~~ a point about 3/4 the total length of exposed ~~lava~~ of old beach. It's disappearance is probably due to the dip of the ~~layer~~ deposit generally to below the sea level.

The fossil deposit does not reach the upper surface of the cliff & outcrop as distinctly as the fig. might indicate, for that end is much broken & covered so that the probable connection is nearly entirely concealed.

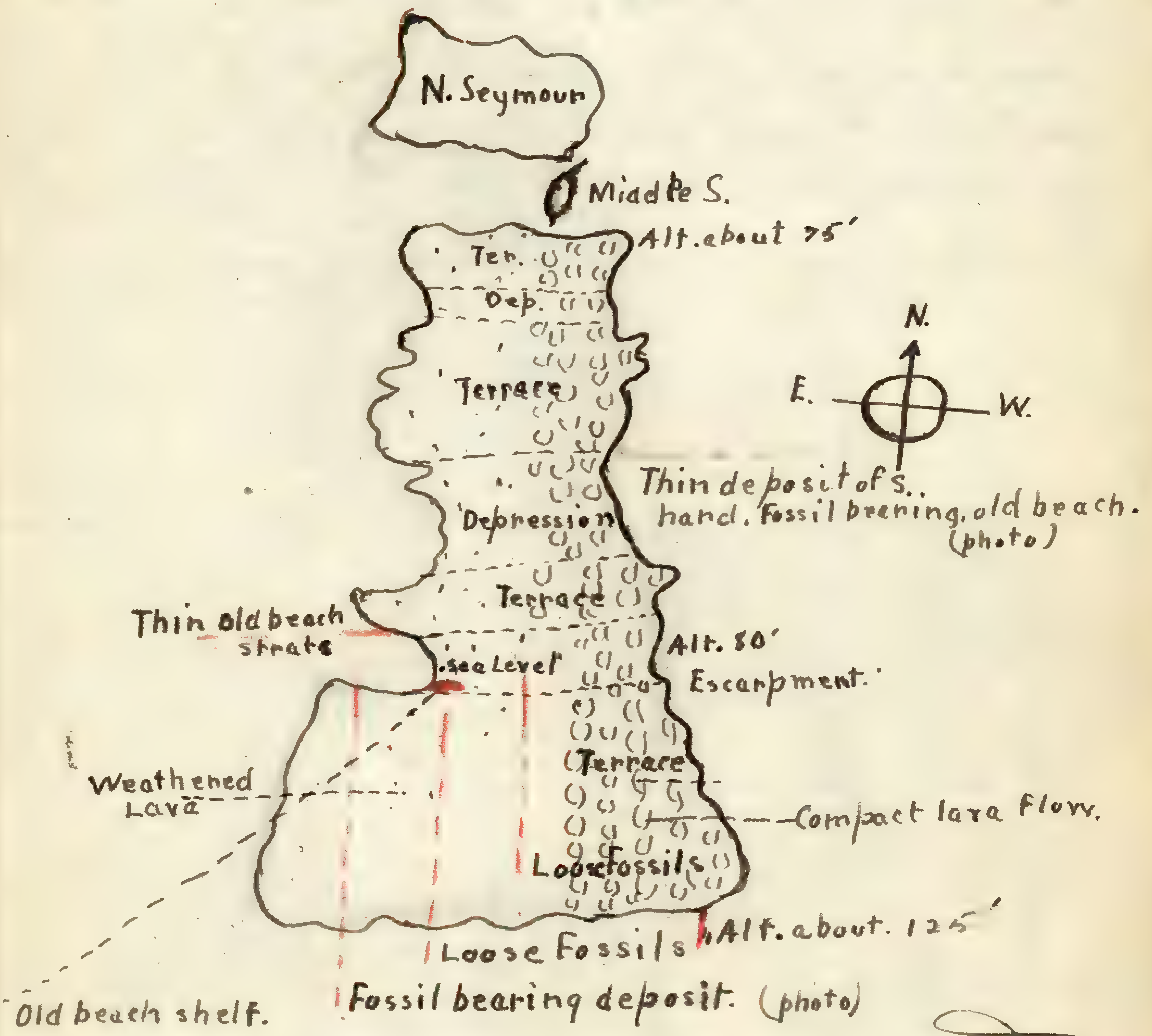
Seymour. Fig. 3. No. "1" & "8".

Box. No. 16.	Bivalves	6.
	Conus etc	3.
	Specimens taken from top of cliff. Figs. 5, 6 & 35.	5

Seymour. Cliffs. Figs. 5. 6, & 35

Box. No. 17.	Cypraea	1.
	Turritella — 12 parts	2
	Bulla	40
	Pecten - large	1
	"Sand Dollar"	2
	Murex	1
	Conus & similar	2
	Natica	6
	Trocus	20
	Turbo	75
	Pecten — single valves	10
	Bivalves - small	25
	Ostraea - like	20
		219

Fig. 96


N. Seymour
Middle S.
Alt. about 75'
Ter.
Dep.
Terrace
N.
E.
W.
Thin deposit of sand. Fossil beening. old beach. (photo)
Depression
Terrace
Thin old beach strate
Alt. 80'
sea Level
Escarpment.
Terrace
Weathened Lava
Compact lava flow.
Loose Fossils
Alt. about. 125'
Loose Fossils
Fossil bearing deposit. (photo)
Old beach shelf.

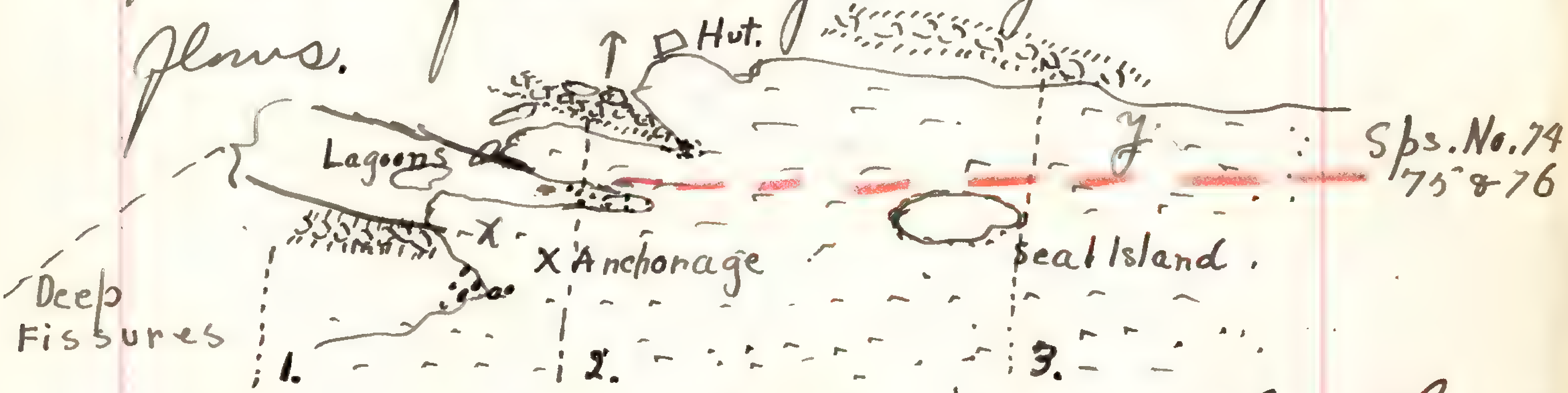
Seymour - general arrangement of terraces & depressed areas etc.

The figure is intended to show also the great difference between the E. & W. sides of the island :- the E. high & sheer, and almost an unbroken lava flow the W. sloping slowly to the ocean's level and the whole surface quite weathered & broken into loose lava blocks & the reddish clayey sand. The ~~p~~ depression are the only parts of the W. shore line to slope & the ocean's level. At their W. ends the escarpment walls are ~~th~~ steep & attain their greatest heights - while at the E. ends the depressed area nearly unites with the terraces to form a continuous level.

Indefatigable Island

Nov. 3-17, 1905

Made an anchorage on the S. side of the island in "Academy" Bay. Here a number of coves are formed by the jutting lava flows.



Nos. 1, 2 & 3 are high ridges of lava flow. The rock is the dark basaltic form. Running through these ridges lengthwise are deep fissures which extend very closely to the sea level, having a gentle slope inland & conveying fresh water toward the ocean. The fissures & ridges have a slow angling direction toward the higher ground, indicating a trend toward the craters. The ridges have abrupt sides where they abut on the coves & lagoons. They rise to about 75 ft. above the surrounding areas. Walking inland from the ~~Walking~~ hut in the direction indicated by the arrow one proceeds about a mile when he comes to an abrupt cliff, No. 3. of the ridges indicated in the figure. The cliff here rises 75 ft. high. ~~Thus~~ The walk from the coast has been on the sea level. Looking at the low land between the ridges & the number of lagoons it ~~would~~ is seen that the region is one of subsidance. The ridges because of their thicker flow structure have a strength & size to make them stand out. At "x" & "y" where the ridges jut out into the ocean one side has fallen into the sea leaving an abrupt cliff. This break & fall away is toward the side facing the low lagoon area.

Again, the territory traversed in going from the hut to No. 3. has the peculiar sink hole formation of the lava which is so characteristic of a lime stone region of subterranean cavities.

No observed evidences of rise.

Just here some reference should be made to Darwin's statement that the craters are all open to the S. indicating that they were broken down on this side by the trend of the wind as the crater emerged from the ocean. Observing the craters both large & small, on this island it was found that this is not the rule. The high crater of the top ~~seemed~~ was broken off to the W. The lesser craters of the side have their craters broken in a down hill direction i.e.: if they be on the S. side the lower or broken side is toward the S.; if on the E. the broken side is toward the E. & the same was true for the W.

Nov. 17.-05.

Cast anchor on N.E. side of island.

For miles the coast seems almost an unbroken line of cliffs rising from 50 to 150 ft high. The spot opposite the vessel is a short narrow beach of basaltic pebbles.

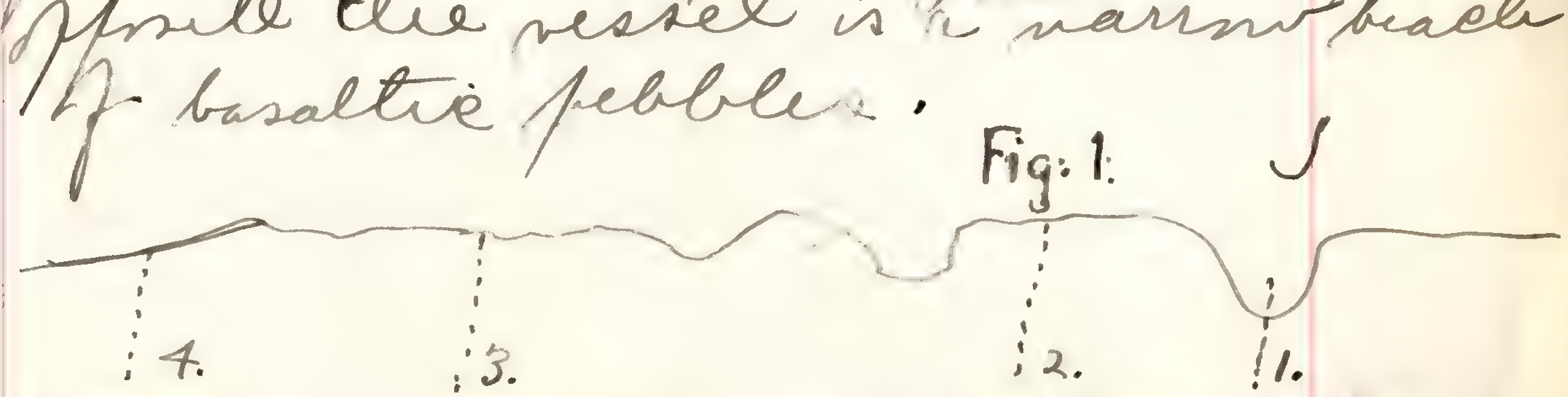


Fig: 1.

Nr. 1. is a promontory about 30 ft. above the ocean. Its structure is a black basaltic vesicular lava. At the top is a cap of crystalline ~~sa~~ altered sandstone. This sandstone is abundantly filled with fossil ~~sea~~ marine shells. In securing the specimens considerable difficulty was met with because of the very compact nature of the sandstone. About 20 good specimens were taken. — mostly Conus. & corrugated Bivalves. Above & below the sandstone is the black lava. It appears that the deposit is an old sea beach formed after the ~~first~~ one lava flow & then buried & preserved by a succeeding flow.

No. 2. is the landing.

No. 3. is an almost columnar formation of lava.

No. 4. Is the important cliff from which a number of fine fossils were taken.

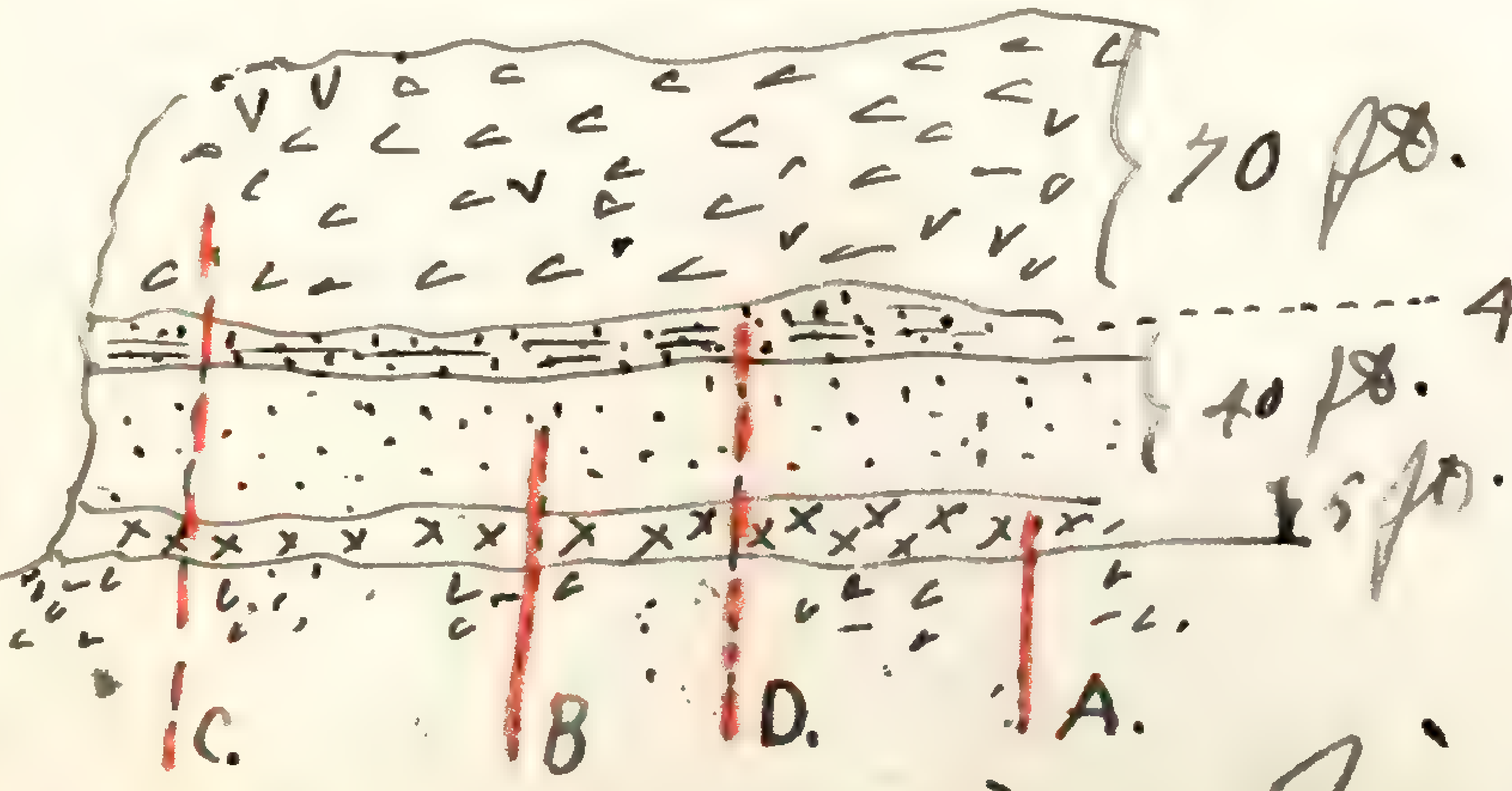


Fig. 2.

The accompanying figure shows the

cliff as it appears from the sea. "A" is a hard, compact crystalline sandstone, the same as that of No.1. in the first fig. Their fossils are the same, the height above the ocean slightly different, and the connecting old beach line may be easily traced along the sea wall from No.1. to No. 4. Along this length of sea cliff the white line of sandstone, which in some places breaks to form sand, is traceable to Nos 1 & 4 as extremes. At No. 3. it is nearly hidden by the more compact partly columnar formation of the lava.

Just above formation "A" is another formation, "B" which unquestionably represents another division in time. Its structure is a reddish, tufa like ~~compact~~ sandstone which yields readily to the hammer in a crumbling fashion. (Specimen taken). The whole cliff is a sheer wall of some 115 to 125 ft. height. From the blocks which have fallen from formation B. a fine bunch of fossils were taken. At the upper edge of ~~the~~ B. just between B. & C. a number of other fossils were seen protruding from the rocks. "A" formed a natural shelf some 5 to 8 ft. wide upon which the lose blocks of B. rested & were held as they fell toward the sea. No doubt this shelf is due to the much harder character of "A". in its resisting the erosion of the surf. Above B. is formation "C" a hard, rather light grade of a black basaltic rock (Specimen taken) It forms the remaining height of the cliff.

Below "A". again is a dense lava base upon which the above rests.

A hasty examination of the ~~shell~~ fossil forms shows that it ~~represent~~ a life not found here at present.

Nov. 20, '05

Spend A. M. in further collecting in the Fig 2. area. Secured a nice bunch of specimens. Noticed that Fig. 2 must be supplimented by another stratum that of "D" from which nearly all of the fossils are ~~held~~ taken. This layer is uniformly of about 4 ft. thick & forms the contact between the lower red sandy structure "B" & the lava flow "C". It's structure is well illustrated by the matrix of the specimens taken.

About 100 yds. to the S. of Fig. 2 area, around a shoulder of lava flow is another exposed cliff ~~almost~~ exactly like the one just described. Further collecting resulted in a few forms not taken before. The cliff seemed slightly lower here, for the hard white structure, the "A" part of Fig. 2, was just below ~~the~~ the ~~high~~ low tide level & seemed quite ~~indist~~ indistinct.

Secured a few specimens which seem much like fossil bones.

While sailing northward along the E. coast toward Seymour it was observed that the sandy deposit of fossiliferous rocks could be followed ~~entirely~~ along the whole coast. Its height varied some but averaged the same as the two beds exploited. Its position was easily marked by the outcrops of yellow sand running in a narrow thread along the lava cliffs. ~~Its distance~~ ~~places~~

Seymour Island seems cut off from Indefatigable by some great ~~active~~ volcanic activity. Both ~~it~~ ~~the~~ the N. end of Ind. & the S end of Seymour were marked by great lava flows such as to cause the columnar form of basalt. This may have some bearing on the relative age of the fossils reported from here.

Thinking of the relation of the ~~presence~~ of the fossils on Inde. to the theory of volcanic origin: Does it seem possible that a region entirely so volcanic as this must have been were it ~~entirely~~ completely of volcanic origin, could have in close proximity an abundant marine life such as these fossils indicate? It seems more likely that as the region might be one of continental proportions that with a gradual subsidance the marine life would gradually work upward to their accustomed position in the littoral depths & thus keep apace with the gradual subsidance of the island & always present. this last seems the more reasonable because of the presence of the abundant life through at least two separable periods, each of which comes directly after one lava flow & before another.

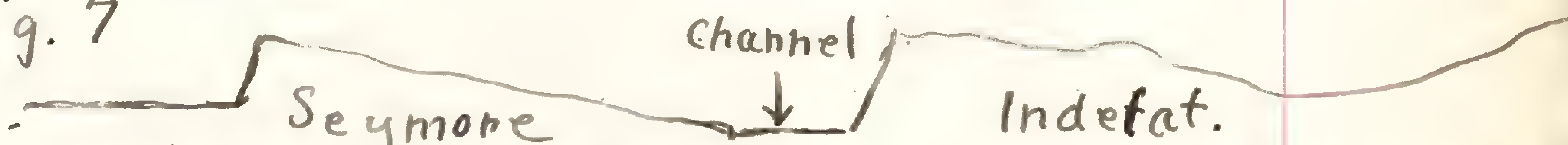
Work on this idea further!!

Try to prove that the supposed bones of todays collecting are real bones if they're not bones what are they?

Indefatigable Island

In sailing to the westward toward Daphne from Seymore we may obtain a good view of the Seymores outlined against the sky & the narrow opening which separates them from Indefatigable. The origin & cause of the separation is quite evident

Fig. 7

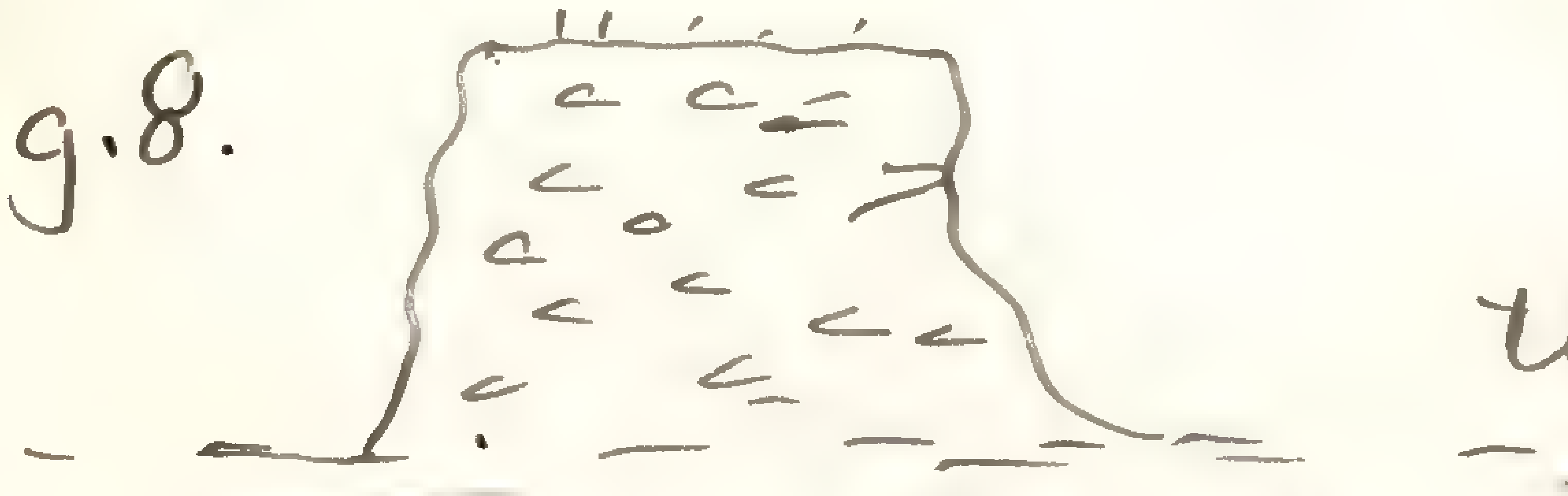


(Determine scale of miles from map)

When the series of subsidences ~~which~~ took place which formed Seymore into its peculiar step nature the shocks at which forms the channel of separation was considerably heavier ~~than the outer~~ near the main island, the probable point of origin, than further north ~~[illegible]~~ thus accounting for the channel which has steadily become deeper because of its lying in the direct line of the S.E. current. It may be, too, that a volcanic fissure may have made the rupture more pronounced.

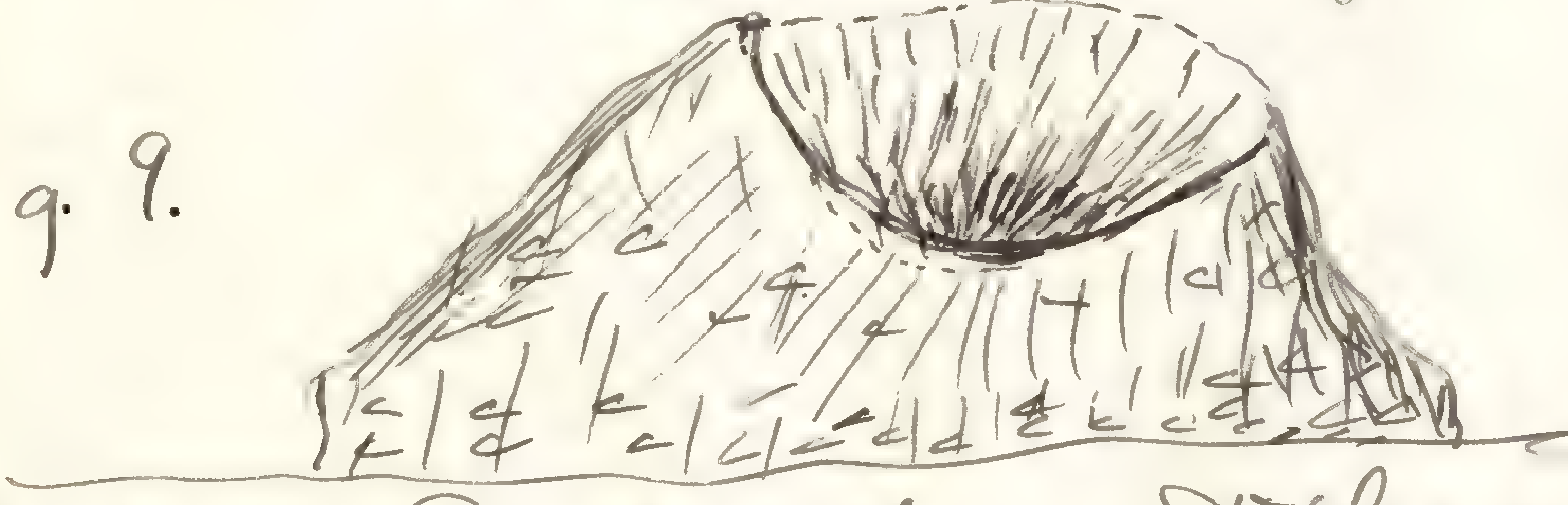
The Daphne rocks, particularly the larger are evidences of the severing action of the great subsidance which tossed Seymour so energetically.

Fig. 8.



This fig. illustrates the abrupt sides of the eastern Daphne, showing the subsidance & subsequent rise which left this isolated rock above the ocean. It was not possible to examine the rocks, but it probably of laccolite structure & origin.

Fig. 9.



The larger Daphne, the one to the westward is far more interesting. The fig. shows a view from the S.E. The rock is about 400 ft. high. ~~almost~~ quite a circle, and about 1/4 mile in diameter. The sides slope at some 25° to 30°. Thus a tufa cap with the crystalline base. The S.E. view shows the old crater broken down in that direction. The crater ~~itself~~ is open

& perfectly circular ~~too~~ to a depth nearly on a level with the ocean. It's bottom is well covered with a ~~marine~~ beach sand like that of the nearby Indefat. & Seymour.

The subsidence which first severed Daphne from Indefat., using that island as a base because of it's size, lowered it to nearly sea level. The ~~prevalent~~ direction of wind & currents broke down the crater in the direction of ~~their~~ prevalent direction, the S.E. These currents & winds, too, deposited the present beach sand in the bottom of the crater. Later, there was a rise sufficient to bring the island to it's present height.

This rise was probably contemporaneous with the flow & rise which exposed the fossiliferous cliffs of Fig. 5.

Fig. 34.

I. West.
II East.

Indefatigable in Outline from Academy Bay,

III. Eeast.

IV West.

Outline drawing of Indefatigable from the S. (Academy Bay). It shows the:—

1. General assemblage of craters to form the island.

2. General slope.

3. Provisional arrangement of Life Zone belts for the material on the land-shells.

Indefatigable.

"Dove Roads."

July. 20-25.

This point of anchorage lies about two miles south of Conway Bay, & directly W. of the great chain of craters leading directly inland. By compass the great chain of craters, undoubtedly marking the major fissure, trend about E. x S. to the great central elevation. From this great central elevation, as indicated in the general outline map fig 34, the chain of monticules trend nearly S.E.

The surface features are interesting & important. The soil is well formed, a loose, reddish, sandy tufaceous material. This tufa soil results from the breaking down of a large tufa crater just near the shore & lesser ones near.

Along the shore at low tide a great basaltic flow of forming a great sub-stratum for the light soil above, is exposed to a vertical thickness of 10-15 ft. Now the thick tufa soil layer - probably 50 ft. thick at this point is superposed directly above the basalt & thus.

indicating another epoch in the age & changing evolutions of the islands. ~~The~~ That subsidance was evidently necessary to produce this tufa over the irregular sub aerial basaltic flow. Now this level of subsidance, taken together with the level indicated by the neighboring one at Conway Bay & the numerous other tufa craters scattered along the coast: must have been low (The subsidance of this region is shown by the specimens of old beach shell sand taken — this aside from the sub. sea nature of tufa itself). It corresponds in present elevation to that of the old fossil bearing beach on Seymour.

~~Then we have~~ Then there are the great tufa craters which lie between Indefat. & James, namely the Daphnes, the Guy Fawkes, & all the adjoining & neighboring ~~st~~ reefs & islets There is every indication that these ones — all of them with the S. E. breakdown of the rim, — are contemporaneous.

Indefatigable.

Then there is the great S. E. point on James extending long & low toward the now broken N. projection of Indefat: the Seymores.

To cut short any further development of the facts. I will conclude that:—

1. The position of superposition of the tufa cones ~~on the W.~~ above the old, basal, basaltic flows, on the W. N. & E. ~~shores~~ of Indefatigable ~~which~~ taken together with the presence of old sea beaches – a subsidence has taken place & a slight re-elevation ~~to bring~~

2. The neighboring outstanding islands, islets & shoals numerous between Indefatigable & James islands are contemporaneous in age of origin and ~~at~~ activity

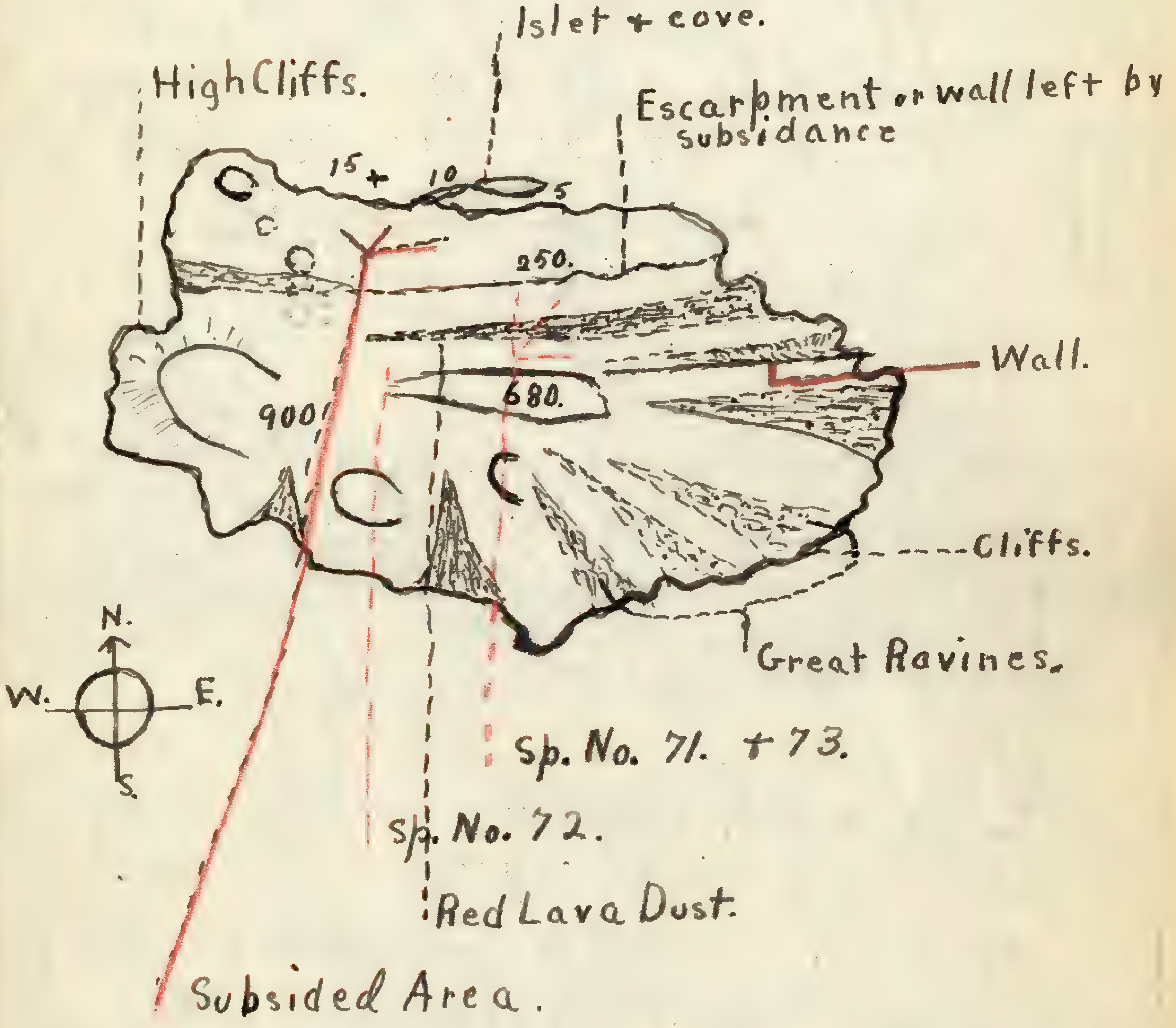
3. The tufa cones ~~marking~~ showing the ~~area of~~ subsidence are contemporaneous with the deposition of the old fossil ~~fossil~~ bearing beach at Seymore – at least the more recent ones.

4. The great land area once connecting James & Indefatigable islands & forms one large island

145 is now beneath the ocean's surface

Barrington.

Fig 33


Islet + cove.
High Cliffs.
Escarpment or wall left by subsidance
15 +
10
5
250.
680.
900
Wall.
Cliffs.
Great Ravines.
N.
W.
E.
S.
Sp. No. 71. + 73.
Sp. No. 72.
Red Lava Dust.
Subsided Area.

The study of the surface features of Barrington shows mostly the activity of subsidance in splitting up island territory & causing other parts to sink beneath the surface of the ocean.

The first great wall like escarpment which confronts one at the place of landing is approximately 220 ft. high rising almost sheer above the area beneath, & dropping abruptly from the country above. The extent of this sunken territory is shown by the part "Subsided Area". – it forms a great strip extending the length of the island, but becoming less in depth of subsidence near the W. & E. ends.

Inland, several more island splitting subsidence walls are easily distinguishable. A large one marked "Wall" is at least 250 ft. high near its Eastern end. – at its W. end it disappears into the general level of the higher area.

The great ravines leading to the ocean on the E. & S.E. mainly, mark the much torn condition of the island.

There are no well marked craters. The trend of ravines etc. indicate the general trend (S.E. - N.W.) of the great major fissure about which much of the volcanic activity took place.

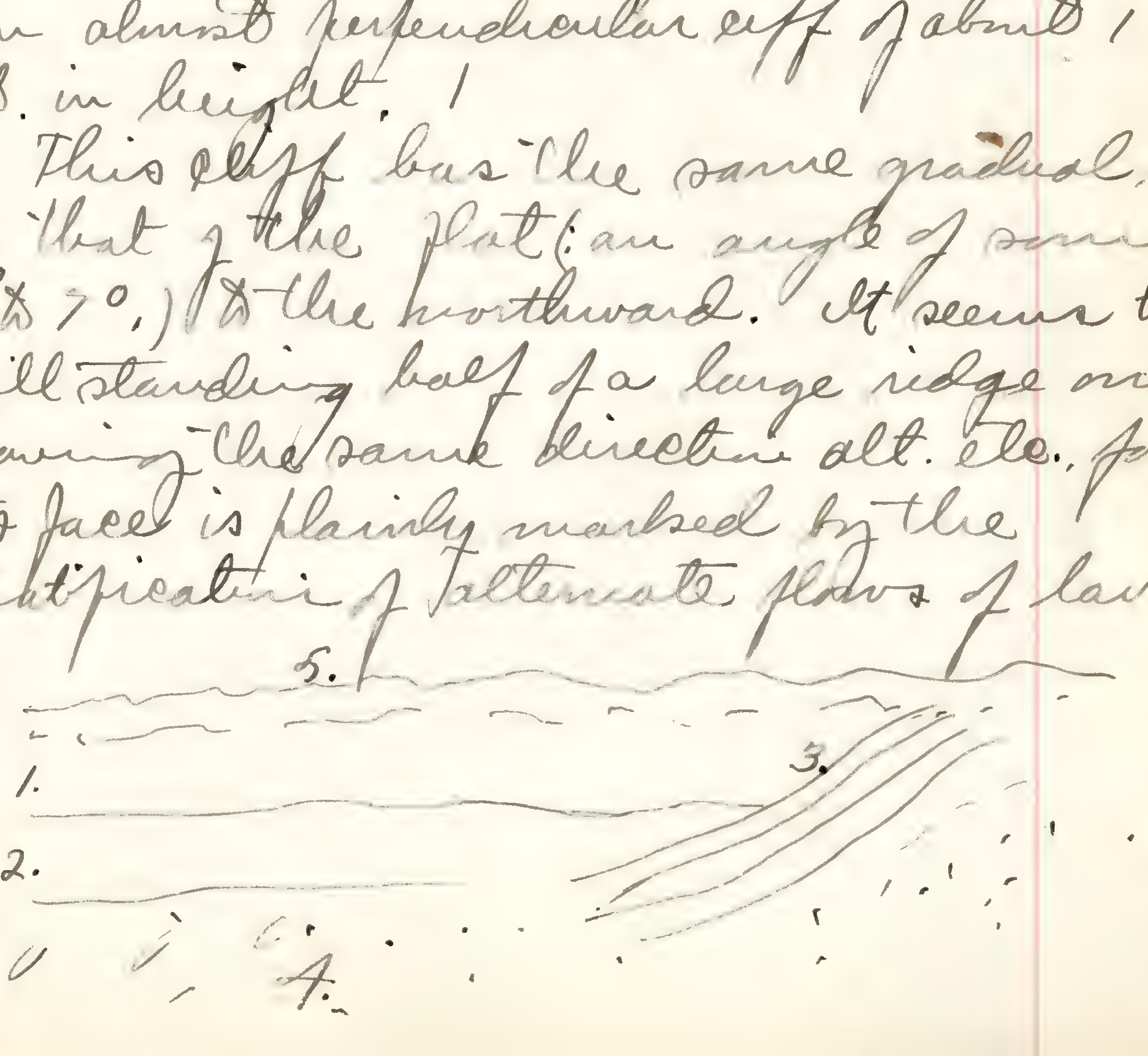
The highest point given as 900 ft. has a S.E. opening.

Barrington Island.

Oct. 20-24, 1905

The whole island (alt. ~~950~~ 650) lies within the dry zone, so not much break down of the usual volcanic rocks can be expected. Near the anchorage on the N.E. end there is a flat of ~~some~~ about 1½ miles in length by ¼ mile wide. The coastal side has a large almost enclosed shallow bay. To the north the plane gradually rises to an elevation of some ~~200~~ 225 ft. where it breaks abruptly into the sea. The shore margin is cut short by an almost perpendicular cliff of about 125 ft. in height. 1

This cliff has the same gradual rise as that of the flat; (an angle of some 5° to 7°,) to the northward. It seems the still standing half of a large ridge once having the same direction alt. etc., for its face is plainly marked by the stratification of alternate flows of lava.



In fig. 182 represents the hard, compact, gray, slightly vesicular lava. 3 is a lava flow at ~~an entirely~~ much greater ∠ thus forming an unconformity:- illustrating lava flows of diff. ages: 4 is the talus covered base where the structure is lost: 5 the rough, uneven, surface of the top of the ridge.

The ridge just described is the first of ~~about~~ four similar ridges running parallel to each other, all having a rise to the north or high end, at about the same angle of rise & all separated by valley like depressions filled with the soft, red dust of broken down red lava. The ridges are composed of exceedingly large ~~boulders of~~ blocks of lava of the hard, slightly vesicular, gray kind. The ridges seem to mark the lines of the greatest outflow of lava, and their direction and angle of rise indicates the point of origin as the high region of the north end.

Investigation of the north end showed it to be merely a higher eminence of the same rocky nature as the southern part just described, except that the valleys disappear & the surface of the area is more completely covered with the lava flow, in the form of blocks slightly rounded by weathering. There is only one evidence of a crater, a small low cone. Both within & without the crater it is covered with the cactus & small bush vegetation characteristic of the whole island. This small vent lying to the E. of the high rise of ground could not account for the lava flows, nor do the ridges trend in its direction. In short there is no crater or volcanic exit on the island from which the great mass of the island could originate or even the surface geology originate. Thus the lava flows must have come from some other source.

From the sea Barrington rises from the sea with abrupt sides, varying from 25 to 100 ft. high, the highest point be the N. end or the one nearest Indefatigable which lies only 10 miles away.

The primary conception of Barrington is that it is the remaining rocks of a great region of subsidence. The conditions seem to indicate that it is a broken off point of the larger Indefat-

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igable. ~~A fu~~

The further investigation of the soundings etc may give additional testimony on the subsidance idea - at least the subsidance ~~to~~ from the group which were ~~mee~~ once one whole & compact area above the surface of the ocean.

During a chat with Mr. Stewart, he says that the idea of subsidance agrees with the actual conditions in flora: distribution variation, relation etc.

Brattle Island

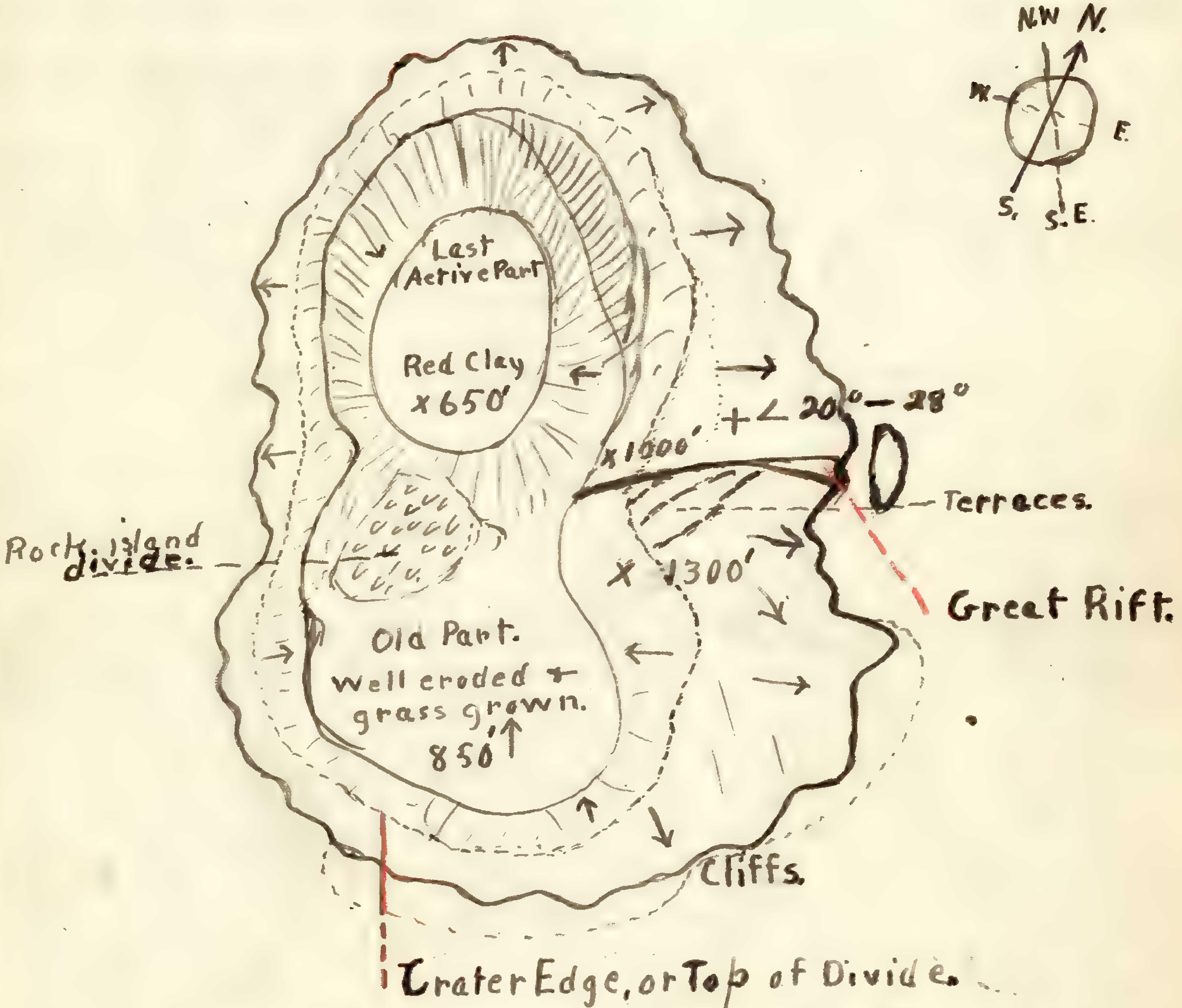
Oct. 30, 1905

During A.M. we visit Brattle island. It arises from the sea in a great half moon shape, slightly larger than a semicircle. ~~abo~~ In dimensions it is slightly more than 1/4 of mile in diameter about ~~ft.~~ 400 ~~300~~ ft ~~thick~~ at the ocean level, tapering ~~sloping~~ uniformly up to the summit c 40 ft. high. On the outer side the sides slope at an angle of 35°; on the inside at 70°. These two slopes coming toward each other leaves the summit ~~almost like the roof of a house~~ almost sharp - only 2 or 3 ft. across. The S. & S.E. side of this great amphitheatre is open to the sea, to apparently quite a considerable depth. This opening has two large rocks rising above the sea ~~to a height~~ perhaps 100 & 125 ft respectively. At a glance, the whole ~~At a glance~~ seems the remains of an old crater. The sides are constructed uniformly, flow layer upon flow layer of a yellow sand stone colored lava - peppered with a good deal of the heavier, dark bluish vesicular ejectamenta.

134 The island is interesting because of an undisputed fact that it represents an area of subsidence. Besides this the neighboring islands known as the "Crossman Roads" represent similar sunken areas. Granting that it is then from the sequence that the whole ~~region~~ it is a region of subsidence. What is the limitation of this subsidence & does it not affect the whole archipelago?

Duncan Island.

Fig. 37


N.W
N.
W.
E.
S.
S.E.
Last Active Part
Red Clay
x 650'
x 1000'
+ ∠ 20° — 28°
Terraces.
Great Rift.
Rock island divide.
x 1300'
Old Part.
Well eroded + grass grown.
850'
Cliffs.
Crater Edge, or Top of Divide.

General "topo" map of Duncan showing the important features

To consider the points hastily we will use a summary:—

I. The trend of the great crater, that is, its long axis being S.E. x N.W.

agrees with other established observations and assists in the general conclusion that the islands are one great chain extending S.E. x N.W. - and therefore plausibly the summits of a once much greater mountain volcanic range.

The actual life of activity in the crater itself tends to confirm the S.E. x N.W. trend - the N.W. end being the last active - as indicated by the more perfect crater, rim, condition of breakdown, and the red, light, vesicular, clay-making material which in so many cases in these islands seems to precede the general ~~cessation~~ dieing out of volcanic activity. Very often, too, this red, material is given out by the monticules, the last active phase in the life of activity of the nearby large crater.

II The great angle of slope 20°-28° & the general abruptness of the sides rising above the ocean without any field of flow at the base - strikes me at the first glance.

The question naturally arises - where is the great field of lava which

Duncan

must have been produced by the great quantity of material exuded by a crater of this side? Generally speaking - after the first sharp descent from the rim of the crater, the angle of flow becomes markedly more gradual until it forms something of a very gradual lava plain; - as for instance the lava plains of the recent flows on James, Chatham & Albemarle. On the N.W. N. & N.E. sides, the very base of the rim is washed by the ocean, forcing the appearance of the island on this side to be that of a mere cup whose rim is exposed above the water's surface. The inference seems warranted - that this crater, like others, had its margin plains of gradual flow surrounding the steep slopes of the crater's rim. ~~As~~ Now that we have agreed upon this, the corollary must follow - where ~~is this~~ are these surrounding plains? They are not now present. Then, the inference, subsidence has carried them beneath the ocean's surface.

III.

The map has marked "Great Rift". This note together with the lines drawn from the coast to the brink of the N.W. crater, indicates the great fault which marks the line of subsidence break.

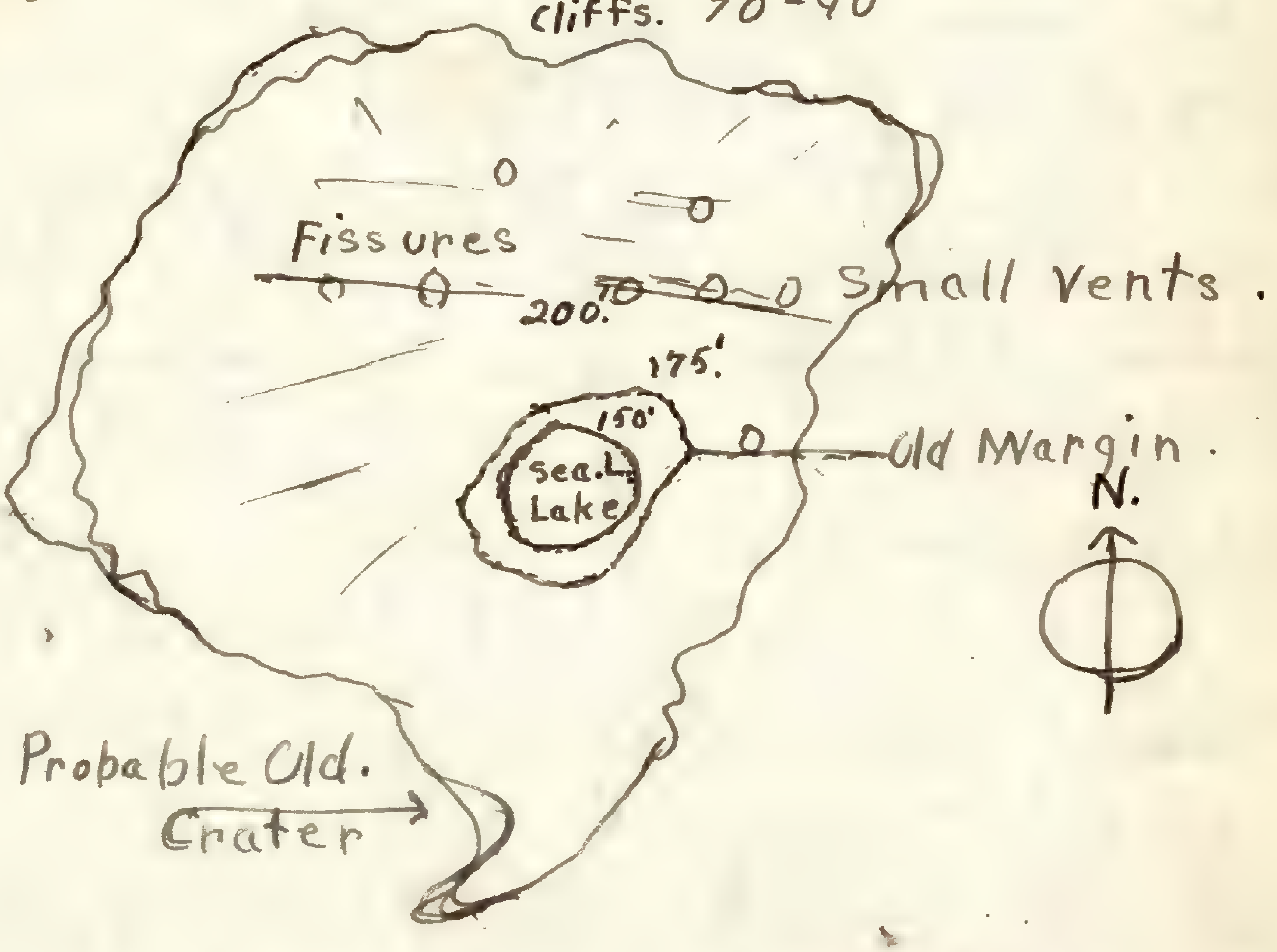
At the coast point this break has the shape of a triangular canon some 150' wide at the mouth. The sides come together about 300' from the sea-shore & from there the line of juncture continues as an escarpment wall. At the mouth of the rift the north side is perhaps 60-80' lower than the south side. This diff. becomes less & less until the point of juncture when the N. side is seperated from the S. by an almost perpendicular rift varying from 7'–18'. Above the wall to the south are two well marked terrace shelfs - seeming to have been formed from a series of slips beginning at the highest point & probably occurring at the same time as the great slip.

Thus the N. portion of the island has fallen and no limit may be stated.

Tower Island.

Sep. 14 + 15., '06.

Fig. 38.


Cliffs. 70'-90'
Fissures
Small vents.
200'
175'
150'
Sea. L. Lake
Old Margin.
N.
Probable Old. Crater

Several surface conditions of Tower are quite different from the true islands visited thus far. The surface is completely covered by a smooth lava flow, broken only by the fissures, indicated by the lines, and the numbers of small vents which ~~island~~ rise from the fissures. The flow has a thickness of about 25' at the crater edge which gradually thins out as it approaches the island's coastal edges to a thickness of 4'-6'.

Slight exudation from the vents & larger fissures alter its general thickness in the particular, local patches surrounding these minor areas of eruption. The ~~The sl~~ angle of slope is very gradual not more than 3°– 6°. The surface curvature toward the highest points is so gradual that the highest elevation, 200'. exists as a gently rounded plain, running nearly E. & W. and just N. of a ~~lo~~ E. & W. line drawn through the middle of the island. The ~~line~~ area of greatest elevation is marked by the largest & most active fissures.

The great crater from which the last flows have had their origin, stands on the S. slope of the island its N. end. having an alt. of 175', & the S. end. nearly 150'. Its margin is absolutely without a rim, showing the extreme quietude of lava out flow. Its old margin is indicated in the figure. Its bottom is filled with salt water.

That the island has broken along the median line. & allow of great N. & S. subsidence is evident from the character of the highest level with its fissures and the fact that the great

Tower

crater is below the higher alts. and in this position could not supply the lava for the last great surface covering eruption. The fact that the last flow did come from this same crater is evidenced by the continuous nature of the flow - beginning at the crater's brink & extending over the island. Again, the south side of the crater is about 25' lower than the N. side. & this depression agrees with the general slope toward the S.

On the N. sides of the island great sea cliffs 70'-90' high expose fine cross sections of the islands structure. There great numbers of lava flows are in evidence - generally they are from 1'-4' thick and ~~they~~ give the cliffs almost a stratified appearance. At one level about 20' below the tops & ~~at~~ between three or four ~~intervals~~ of the last layer flows are thin, reddish, ~~brown~~ clay forming lava dust, indicating long periods of quiescence. The lava flows vary in compactness from the dense closely crystalline structure at the bottom to the light vesicular at the top.

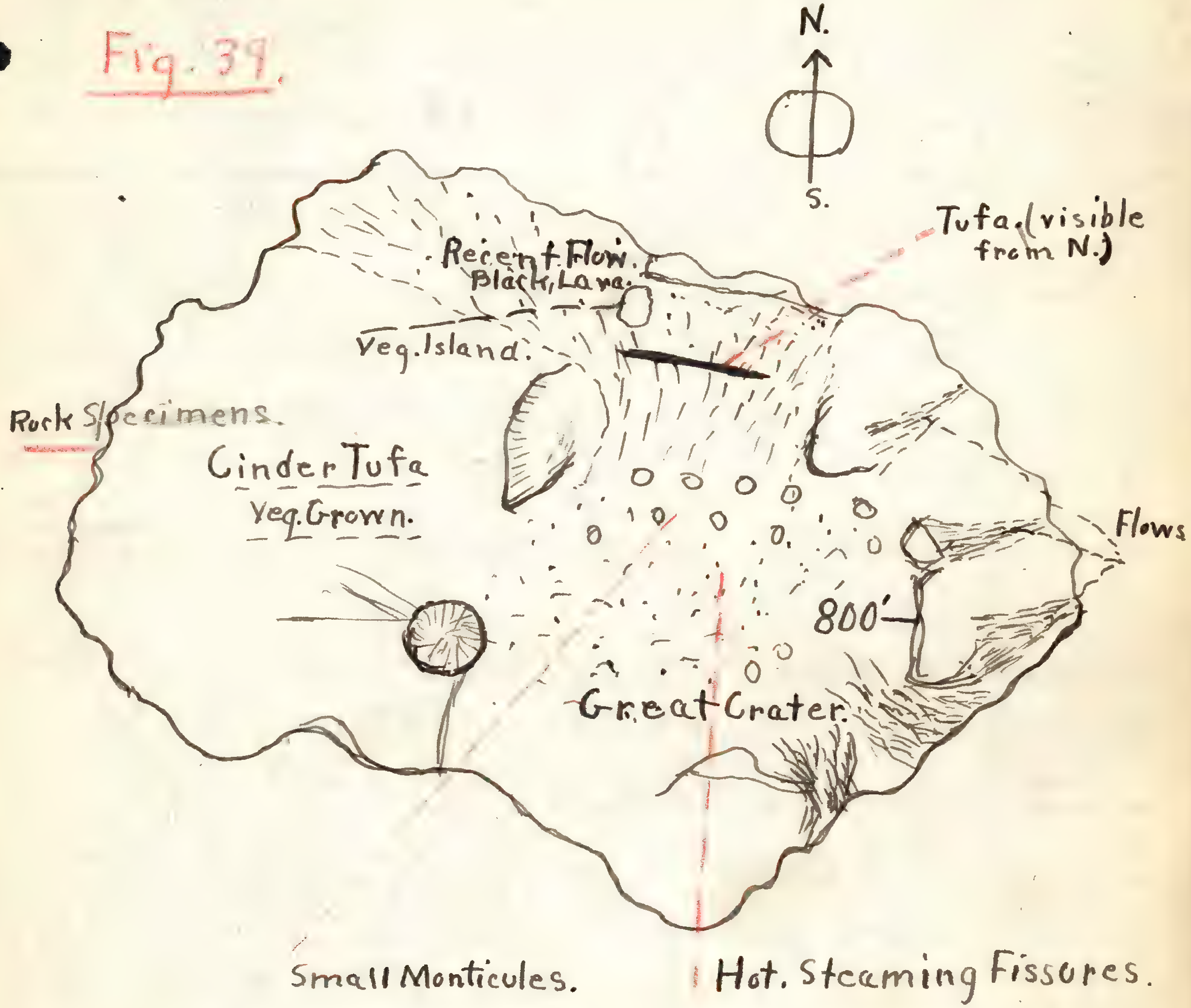
(151a) At one point about 700' in length a thin, yellow, tufa deposit is exposed.

Generally speaking this island seems the best example of a true oceanic island, of those observed thus far.

Bindloe Island.

Sep. 17. 1906.

Fig. 39.


N.
S.
Tufa (visible from N.)
Recent Flow. Black Lava.
Veg. Island.
Rock Specimens.
Cinder Tufa
Veg. Grown.
Flows
800′
Great Crater.
Small Monticules.
Hot. Steaming Fissures.

Bindloe represents some interesting and important details in itself and in relation to the islands to the south. The cross section first shows the great phenocryst flows which form the great plainal basis for the superposition of the island itself. This underlieing lava flow is in evidence along the whole coastal line, forming the coast, and above the ocean's surface seeming to have a thickness of 2'—10'. The rock specimens No.s' 85, 86, & 87 were taken from this flow from its western outcrop of the W. coast.

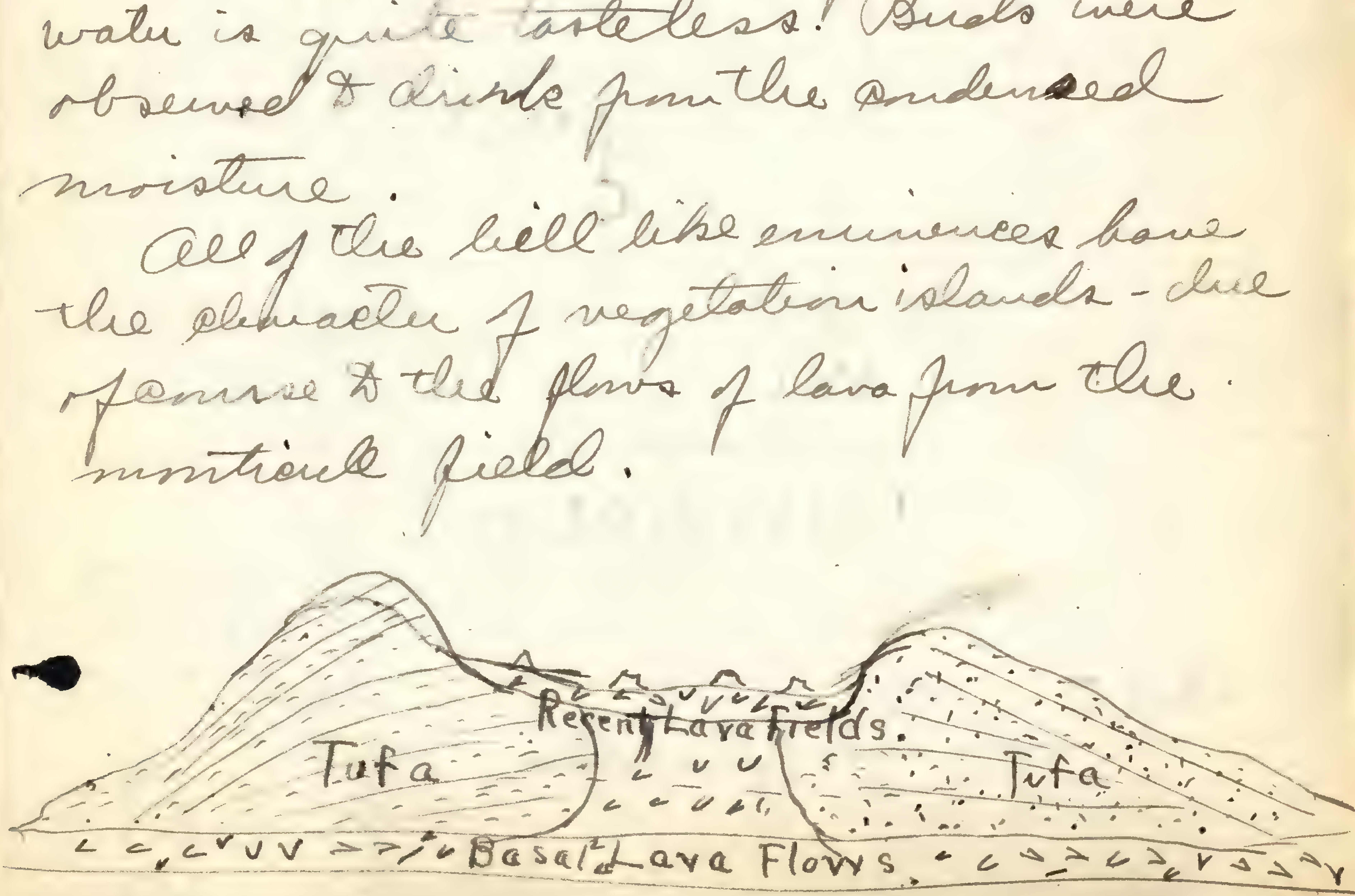
Next comes the great tufa deposit which forms the great bulk of the island. In nature it is generally the same as the dark, dusty, cindery deposit just S. of the spring at Tagus Cove. Even the ~~[illegible]~~ large hill like eminences, indicated on the map as surrounding & marking the old crater, are of tufa structure. On the north where an old cliff is left exposed between the ~~[illegible]~~ tongues of recent basalt flows, ~~the~~ a yellow tufa deposit is visible. It probably has an exposed thickness of 50' vertical - its upper edge being ~~decked~~ covered to a considerable depth ~~of some~~ by the black vesicular lava of recent flow. ~~and~~

Just above & somewhat further back from the tufa cliff, far enough S. to be well within the depressed area indicated by the circular arrangement of hills, is the great field of recent flow and punctuated by numerous small monticules.

¶ It is from the recent activity of this field that the many narrow lava streams reaching the coast have their fountain supply. The lava field ~~at~~ within the depression where there is almost no angle of flow has a smooth, even floor of fairly compact structure.

¶ The lava floor is broken into numerous fissures from some of which a thin hot vapor arises. ¶ Mr. Beck reports that when the vapor condenses to form drops the water is quite tasteless. Birds were observed to drink from the condensed moisture.

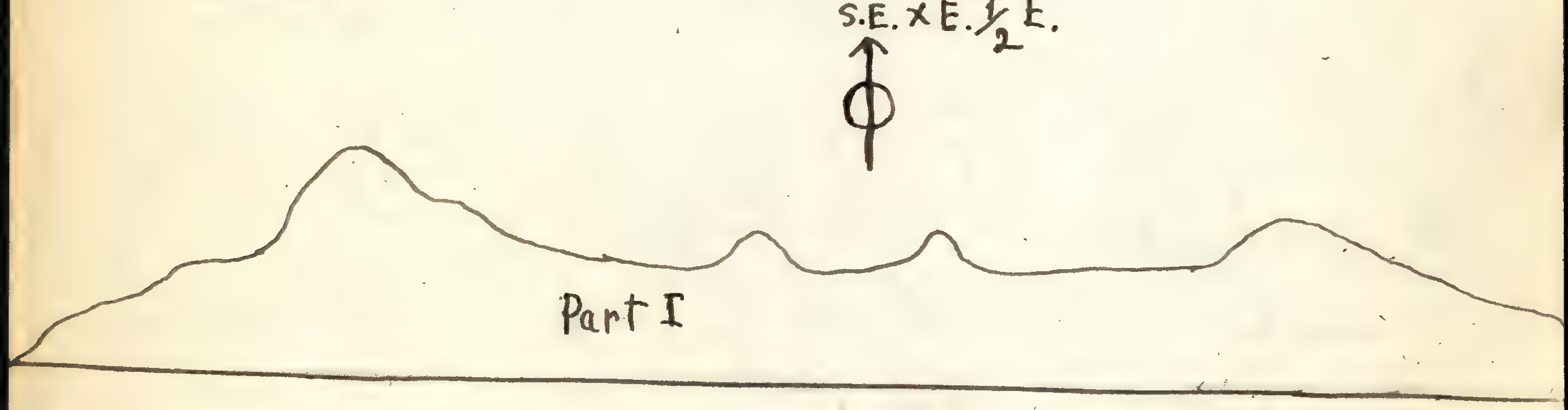
All of the hill like eminences have the character of vegetation islands - due of course to the flows of lava from the monticule field.



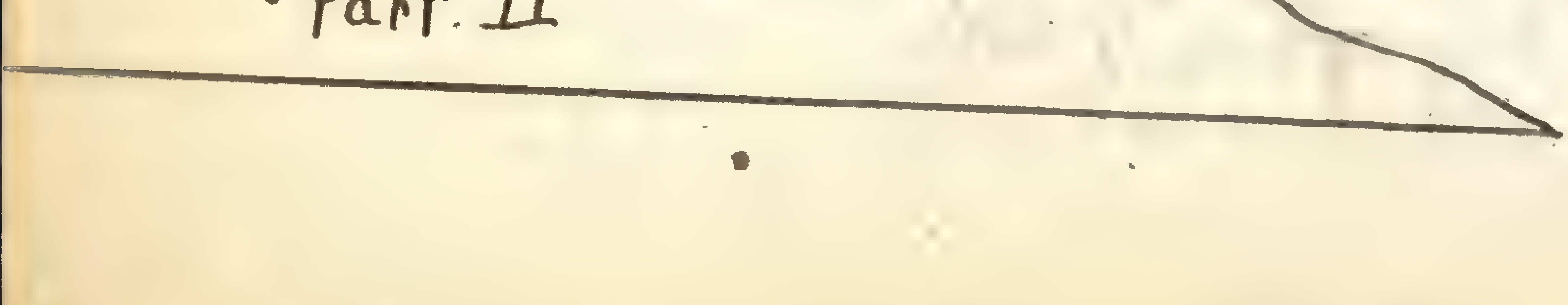
1. In the evidences of recent volcanic activity it is certain that Bindloe represents one of the most recent islands of the group.

This agrees with the observed condition of the other islands and so often referred to that the activity progressed from S. to N.

2.) The great tufa deposit above the lava deposit indicates a time of subsidence and that in this condition it was probably cut off from all land connections with the other islands and thus probably a true oceanic island.



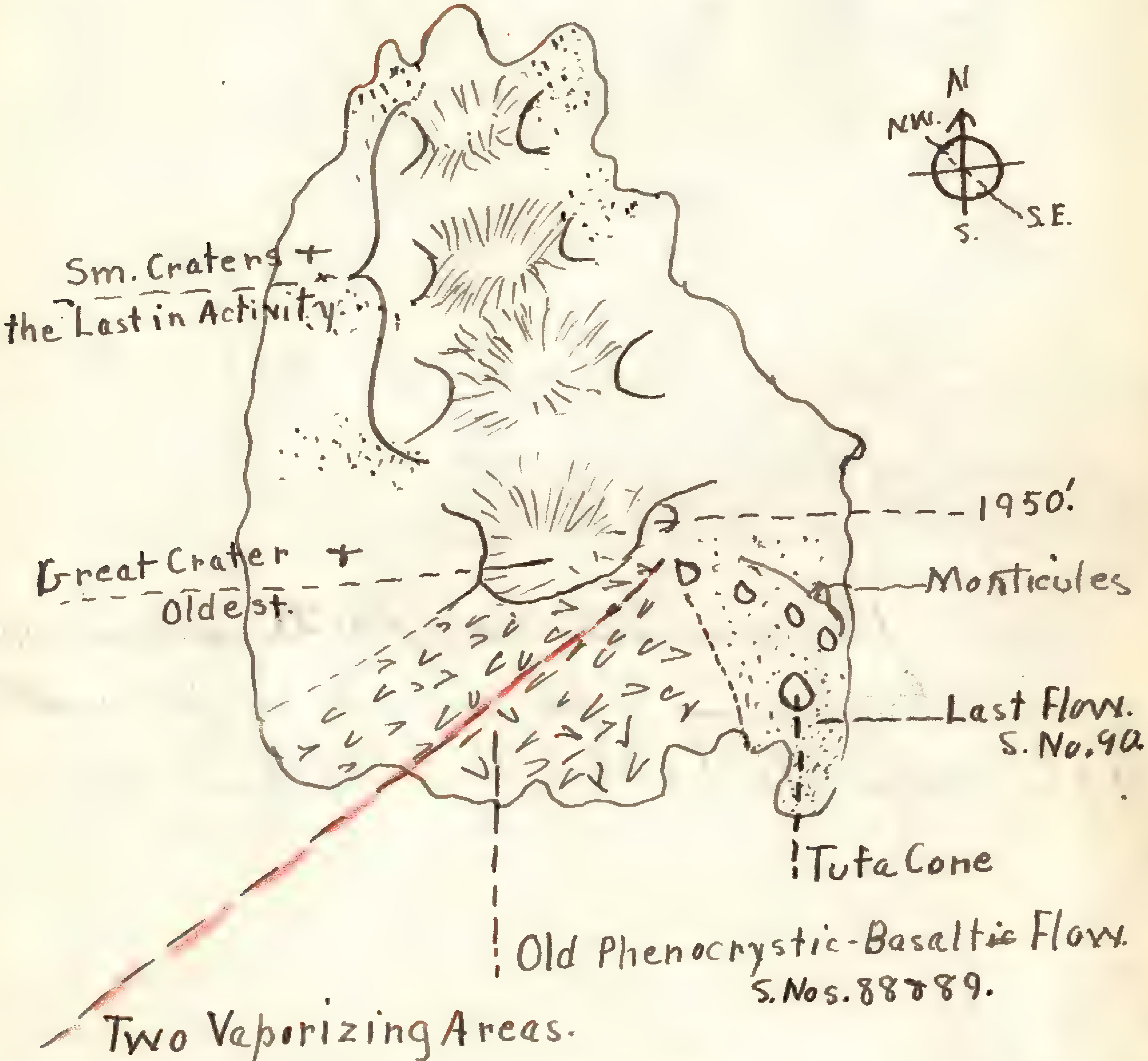
Bindloe in Outline



Abingdon Island.

Sep. 18-22

Fig. 40


N
NW.
S.
S.E.
Sm. Craters + the Last in Activity.
Great Crater + Oldest.
1950'.
Monticules
Last Flow. S. No. 90
Tufa Cone
Old Phenocrystic-Basaltic Flow. S. Nos. 88 & 89.
Two Vaporizing Areas.

The outline map illustrates most of the important points in connection with the hasty survey of Abingdon's surface geology.

1. First in consideration is the

evident progressive tendency of the volcanic activity from S to N. - Slightly E of S. & W. of N. The points are:-

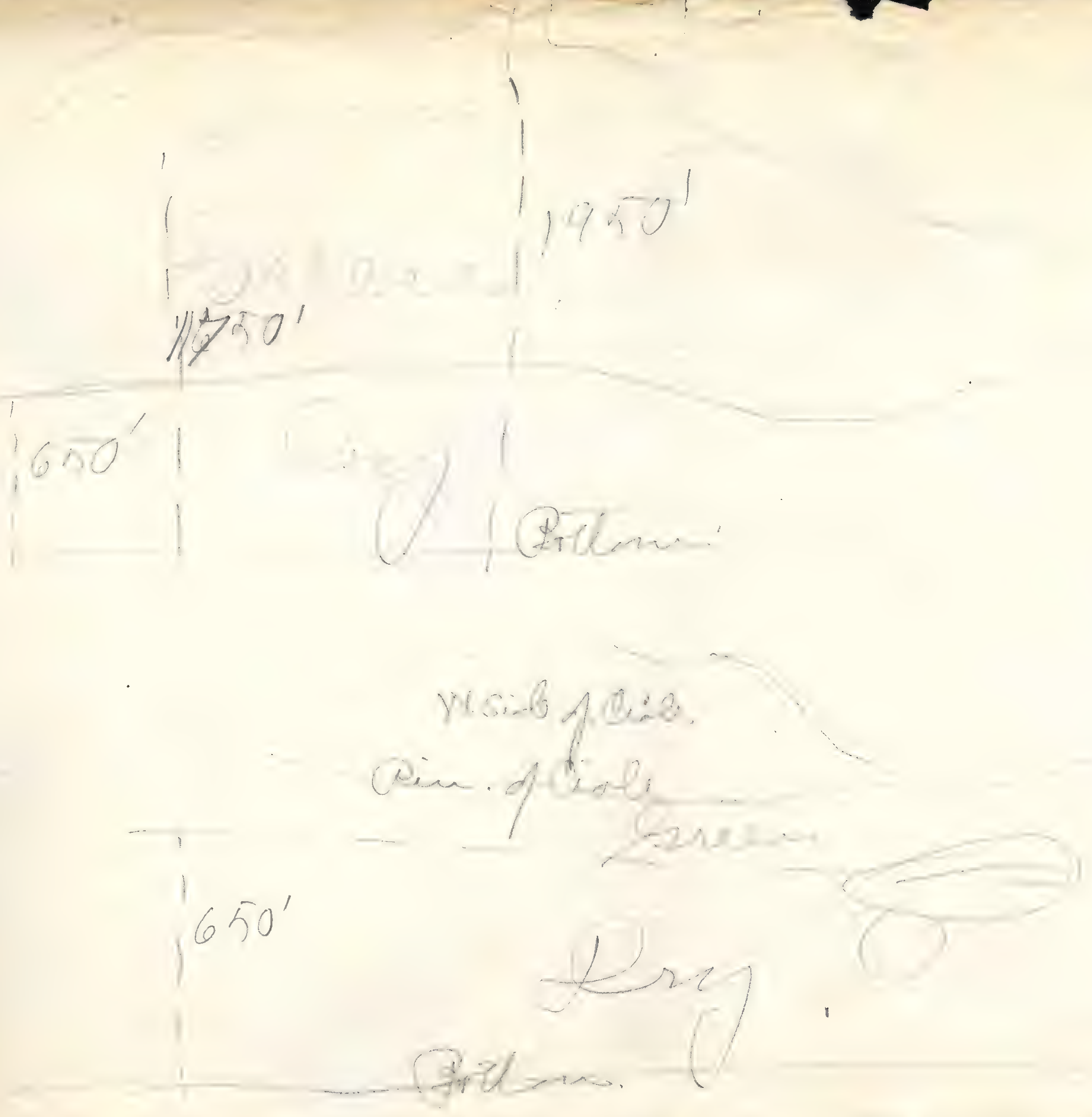
a.) The relative position.

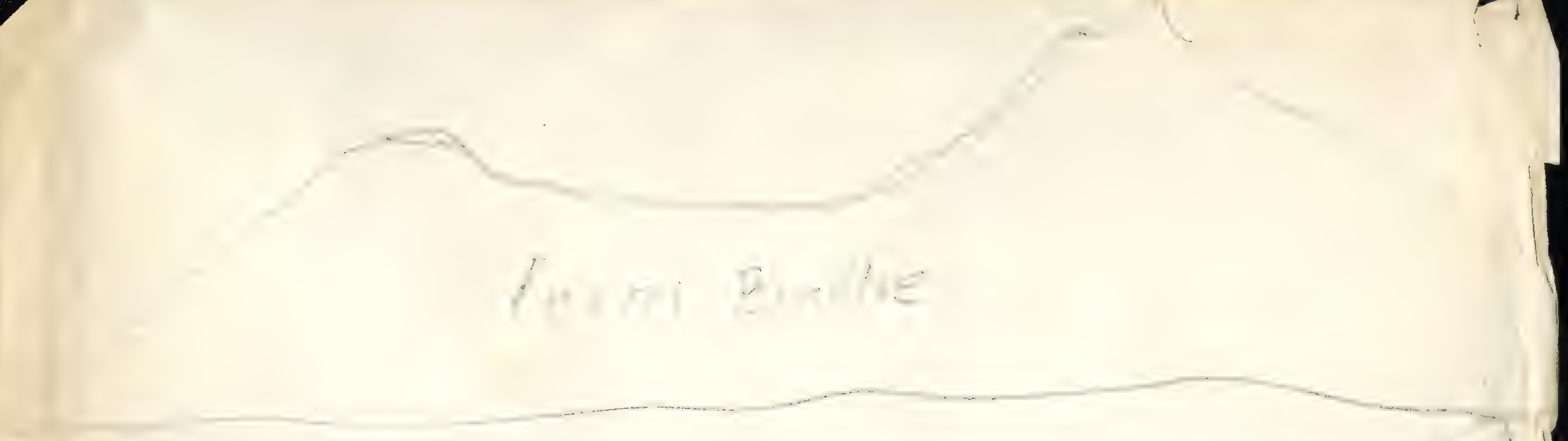
b.) Relative size beginning with the largest on the S.

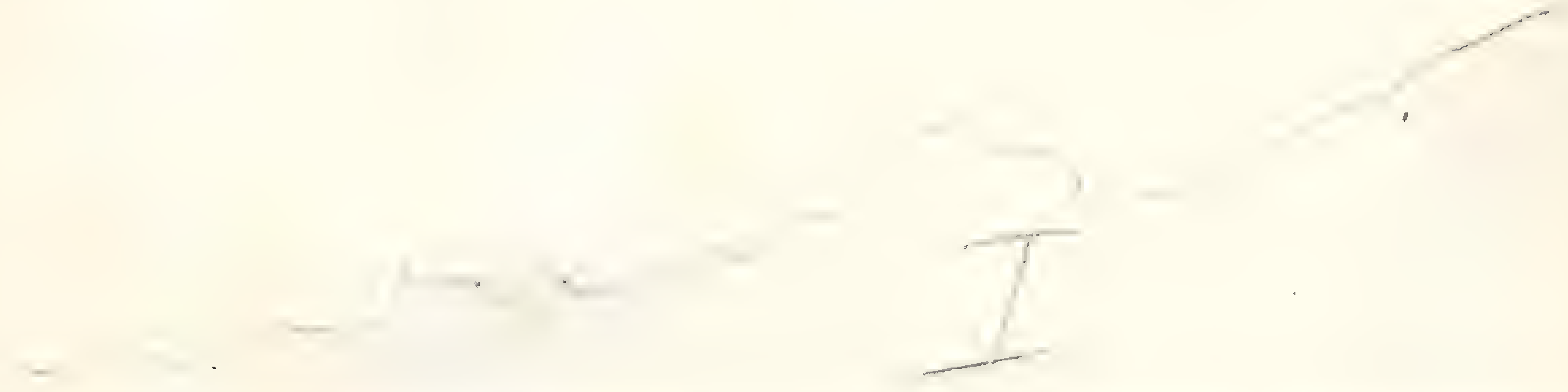
c.) Relative abundance of recent activity from S. to N. - the older to the newer.

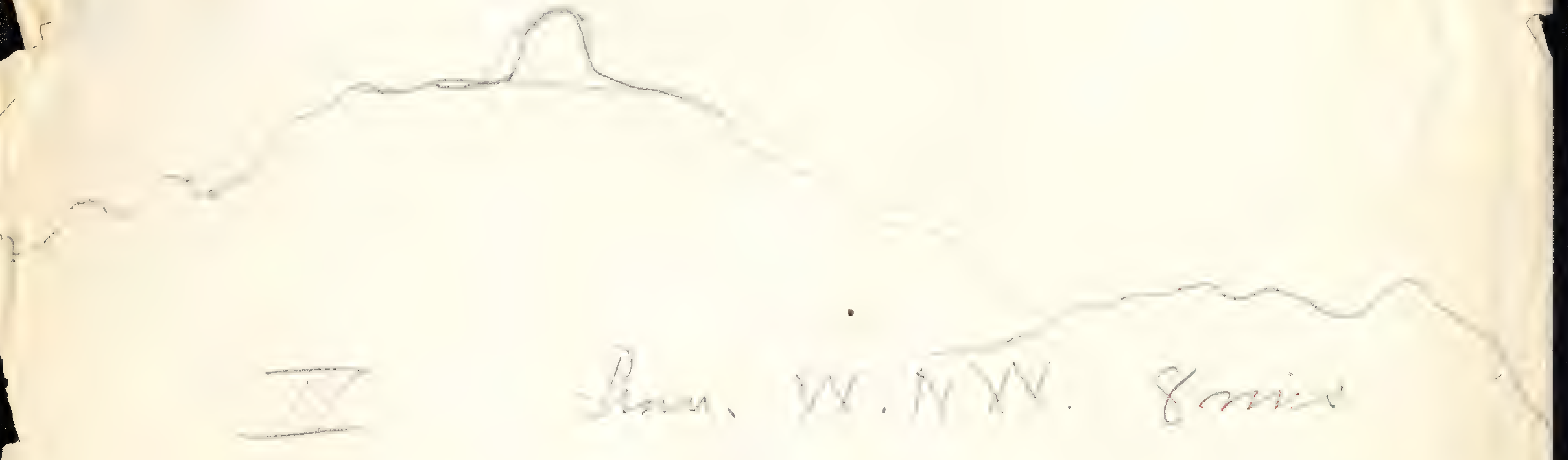
II The probable petrographic diff. & connection between this & the other islands of the group - from S. to N. a continual increase in the size and abundance of the feldspathic crystals.

III The almost complete absence of outstanding tufa cones so characteristic of the islands of the S. & Central groups.


Green


Farm Bluffe


I


II
Bam. W.N.W. 8 miles

Occasional Ideas.

Dana p. 303.

Reference made to the origin of the ascension force in volcanoes. The deep water near volcanic islands being partly an evidence of the truth of the theory.

May this not explain something in regard to the subsidance of the area in & about the Galapagos & between them & the mainland?

Dana. p. 304

Reference mad to the sequence in volcanic rocks – is there a natural system? What evidences in the rocks here?

Dana. p. 272

What about lateral cones & elevations forming neighboring islets & shoals? Do the outlying rocks in the Is., the majority at least, show a submarine origin or do they show subsidance evidences?

Dana p. bottom p. 282, top of 283.

He remarks that the trend of the Hawaiian islands is nearly east & west, like the parallel ridges of volcanoes; & remarks that the volcanic activity begins to die out at one end first. What relation is there in this to the Is.? Are they somewhat parallel? If so, is there any indication of the more recent volcanoes at one end of the lines than the others? It seems now that the S.E. isles are the "older". Then Dall's suggestion that the derivation of forms is from the S.E. is not necessarily true, because granting that they are older they have a greater opportunity to develop an extensive life. Again the direction of the moisture laden winds impinge first upon the S.E. isles. This last fact must be shown to be insufficient to acct. for the apparent greater breaks-flaws in the S.F. island rocks & thus destroy the fact that they are the older.

Tryon Vol. I. ~~B~~ pps. 166, 167, 168 169 etc.

He calls attention to the relation of West Coast forms with East Coast or Atlantic forms. Suggests some similarities & possibilities (geologic) of the proving of similar or exactly the same species for the two provinces.

Rather important.

Darwin. Voyage of "Beagle"

pps. 130 - 133.

Important observations on the likelihood of S. & N. A. being united at one time. West Indies as area of subsidence - its possible relation to the Galapagos.

Albemarle

March. 10 - 1906

Following the trail inland, one finds a striking example of how a ~~long & older~~ strip of territory may act as an island of vegetation when on one side or both the lava flow may obliterate all life. From this island will spring the parents of the plants which will at once repopulate the ruined territory once the lava is in a condition to bear life. Illustrates:-

1. That the old conditions & inhabitation have thus been able to persist
2. That naturally the more hardy forms are able to survive.
3. That the vegetation need not necessarily be introduced by currents etc. after the manner of the hypothetical ideas advanced.

Certainly seeds that might be carried to these islands would have a very marginal place to sprout. How:-

1. Could the tender forms survive?
2. " " life zones be developed & each take its place in a suitable habitat.
3. Could the plants exist in a condition of the lava which must necessarily spring from its

first rough, fresh nature. ?

4. The last condition of the lava must exist ~~because~~ at the time of the coming of the plants & animals for even at present when things are all here the coast presents an extremely rough character

March. 15, 1906.

For the moment it is conceded that the islands have been peopled by accidental planting. Now with the evidence gathered of the manner ~~of~~ in which volcanic activity has been persistent among the islands even after the great & major craters have become quiet it is shown that the whole coast, & especially is this true of the S. & S. E. sides, has been segmented & cut into ~~alternately~~ by hot & old areas. Now these lesser flows have crept out to the coast in ~~[illegible]~~ slow, sluggish stream, easily stopped, easily cooled, to disturb the otherwise quiet coast & cut ~~the~~ this old ~~coast~~. cooled, eroded coastal plane into numbers of narrow patches of accessible beach.

Thus ~~again~~ of the chances for accidental visitation are greatly ~~reduced~~ diminished by a reduction of the accessible coastal

89. area. With the first point conceded this consideration is an important one by way of opposition.

March. 23. 1906.

In Edmunds Heller's paper on Reptiles he makes some simple observations on the geology of the islands. He makes mention of the Subsidance theory & attempts to refute it. He mentions that the fact that a rise of 11,000 ft. necessary to unite the Galapagos with S.A. is a quite impossible barrier to the acceptance of the theory. He states that at the same time the S.A. coast region has been rising

Darwin. Voyage of the Beagle"

pp. 320 - 321

An important observation on the finding of marine shells at an alt. of 14,000 ft. their age the same as the shells of Europe. He makes important observations on the amt. of rise & subsidance [illegible] necessary to produce the conditions he describes.

This has an important relation with the objections offered by

Occasional Ideas.

Mr. Keller. the ~~fact~~ truth it is an important fact concerning the practability of the subsidance theory.

Elements of Geology, Le Conte.
pps. 95 & seq.
Should be read for important ideas on:
1. Cause of volcanic activity.
2. Formation of tufa.
3. Origin of basalt.
4. Volcanic activity very superficial.

Darwin, Voyage of the Beagle
pps. 331– 333
More important observations on the history of the Cordillera.

April. 20, 1906.

From an investigation of the islands thus far it is observed that all the outlying points & islets are of tufa structure & evidently of oceanic origin. Now the consideration arises – can it be proven that these tufa cones alone are of oceanic origin – that there are no other parts of the islands exhibiting true oceanic origin. Now if this can be shown, then these tufa cones are the large monticular vents which at the time of subsidance were brought to & below the ocean level & there finished their activity.

Now following this consideration up by an observation of the monticules on Albemarle & Narborough especially, it is seen that the cones which yielded the older of the recent flows are easily within the 500 ft. alt. above as a limit. Then further, the the vents which supplied the recent flows have their position just below the present rim of the great crater.

The idea desired here is that with continued subsidance the vents are carried higher & higher

April, 30, 1906.

In considering one of the arguments advanced by Dr. Baur, - that a subsidance in the present region of volcanoes would form so-called volcanic islands. Now considering this we must determine what the relation of the islands of Behring St.

is to the mainland of Siberia & Alaska.
I believe those islands are considered volcanic
& yet palentologists & anthropologists
seem to agree that these islands were once
a connecting link between the two
worlds. and made possible the inter-
continental communication between
the life developments of the two ~~regions~~ continents.
The same question may be put to
many other islands now considered
oceanic.

- - - - - - - - - - - -

It has been worked out so far, that
the Galapagos group have an exact
parallel in the Hawaiians. Thus some
study is due them:

1. What relation has the life of this (H.)
group with that of the mainland?

2. What is their relative position on
the map. with neighboring islands which
might have formed the connecting links
between this group & a parent main-
land?

3. What are some of the anthropological
conclusions as to the formation of
the Hawaiian race? Etc.

Occasional Ideas

Wallace. Island Life p. 235
Statement & map of Azores showing a N.W. & S.E. trend. Also an attempt at a determination of the age of the islands. - Miocene and the declaration that it does not indicate a former union of the groups.

Wallace p. 238.
Bottom of page is a statement which indicates the origin of Dall's idea on land shell distribution. The statement is meant to refute the idea of union of the islands but forgets to take into acct. the relative fertility of the islands in supporting life. From the trend of the islands I believe it geologically true that those ~~islands~~ nearer the mainland are the older & the better able to support life. It is hardly true that had the life made its first passage from the coast to the islands that it would not spread itself equally among the islands, providing all the islands offered the same advantages.
The inter-island distances are comparatively so small.

Wallace. p. 243.
Reference made to Land Shells of Azores. That the number of peculiar forms are to be attributed to a remote period of introduction.

Wallace. p. 256.
Land Shells of Bermuda

Wallace, p. 264.
Statement that the giant tortoises are considered to be derived from America: If so, of what age? At what remote time? So far as I know now, they are found in the N. Am. in the Miocene alone

Wallace. p. 267
General statements on the birds are of interest.

Wallace, p. 272 & seq.
General work on plants is valuable.

The statement is made that the plants of the upper levels are like the temperate plants of N. Am.

This agrees very nicely with the idea of subsidence. When the great islands ~~had been~~ furnished with N. Am.

plants, the subsidance killed the life of the lower zones & thus laid this part open for new ~~immigrants~~ plants. This was supplied by immigrants from S.A. This is carried out by the observation that the lower zone plants are S.A. forms; they are the closest allied to S.A. because they are the most recent acquisitions – it being granted that peculiar forms have a remote period of derivation. Again – these species which are identical with S.A. & have very apparent relationships have a special means of seed transportation. This indicates:

1.) that at the time of the introduction of N. Am. plants conditions were more favorable for transportation.—

2.) That the S.A. plants have been introduced at a later period (having had no time to differentiate) and when the conditions for introduction ~~are~~ were more difficult.

From these considerations it is easily apparent that at some fairly remote period the present land now forming the Galapagos archipelago were in a far more immediate relationship with the mainland & N. Am. especially.

What could ~~this pose~~ have constituted this more favorable condition for the introduction of life.?

Wallace admits that there may have been intervening islands to act as stepping stones.

The union of the islands into one large island would increase the chances of the landing of accidental stragglers.

This last involves the consideration of a former much higher elevation in the islands. - perhaps enough to bring forth the missing stepping stones. Conversely stated - the idea of intervening islands concerns itself with an elevation - perhaps enough to make the islands one large island.

Occasional Ideas

In his concluding remarks. Wallace makes use of ~~good~~ ideas on the Gulf Stream & the time of the Glacial Epoch. These are valuable. I shall probably be able to determine from the fossils collected that the formation & antiquity of the islands goes back. ato the Miocene - at least to its beginning. Then a consideration of the Glacial Epoch; the separation of the two continents: the new path of the Gulf Stream etc are pertinent.

It must not be forgotten that the new conception of the temperature ameliorating properties of the Gulf Stream are valuable. and though the carrying power of this Stream when diverted into the direction of Galap. might assist in accidental immigration This means of transportation might seem plausible as an explanation of why the older plants & animals have a relationships with N. Am.

But the employment of the Gulf Stream involves ideas as to its origin. Assuming the anti-cyclone theory to be true - and we have the best testimony

197 in favor of its acceptance., then with profound changes in land & water areas; & ~~diminished~~ varying uniformity in the distribution of the sun's heat etc.; what was the position of the anti-cyclone centre? This again goes back to the theory for the cause ~~formation~~ of the Trade Winds.

Wallace makes reference to the idea of cause p. 135.

Must look up the subject further in meteorological treatises.

Write:

Mr. Harvey Maitland Watts
writer of the article in the Scribners. April. 1902. "Gulf Stream Myth & the anti cyclone"

Professor Cleveland Abbe
U. S. Weather Bureau.

— — — — — — — —

Deutsche Seewarte
Hamburg.

This is the German Bureau given over to hydrography.

Occasional Ideas.

British Hydrographic Office
Probably London, Eng.

- - - - - - - - - - - - - - - -

Mr. H. N. Dickson
Lecturer in physical geography
in the University of Oxford.
Paper entitled:
"The Circulation of the Surface
Waters of the North Atlantic Ocean".
Published in ~~189~~ 1901

~~Lan~~ Wallace, pps. 73-75

Land - Shells - Dispersal and antiquity.

Zittel. pps. 492-502

Palaeontology of Pulmonata

~~Gastr~~ ~~Zit~~

Zittel. p. 436.

Literature references on Gastropoda

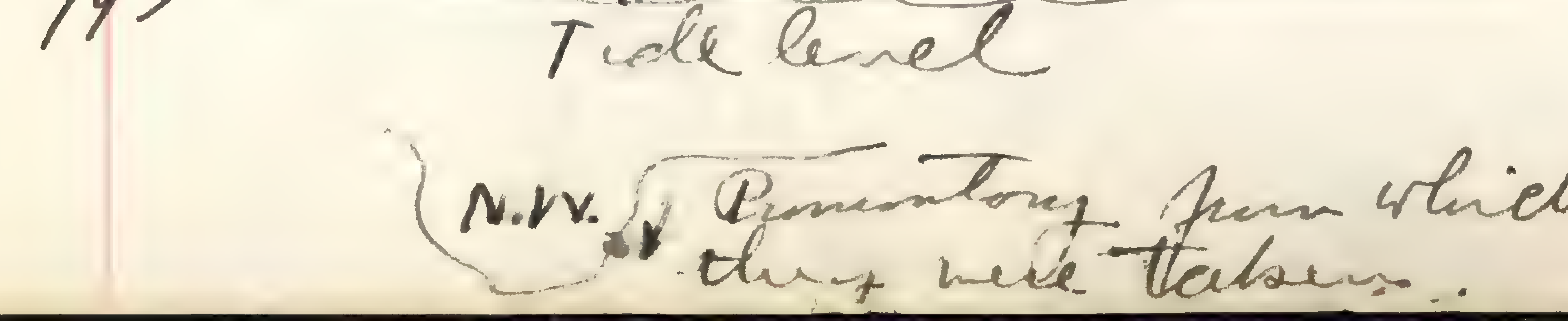
Zittel. pps. 344-345

Further references on Mollusca.

St

Rock Specimen Catalogue

Specimen No.		Number Specemens
19	Good specimens of the lava flow which forms a sort of base for the super position of the dark rocks No. 20+21	2
20	Dark, close grained, crystalline, igneous rocks, taken from the parent mass which forms the whole surface mass of both Hood & Gardner. It is a rock described in the notes as the one having the loud metallic ring - equal to a gong bell when hit with hammer	
21	Same rocks, position a few ft. deeper	17


20
21
19
Tide level
N.W. Promontory from which they were taken.

167 extinct st.

No. 22 - - - - Chatham - - - - - - - - - - - - - 4.

Specimens taken from the hard, lime-sand of the old beach. The weathered hard side of the specimens is the side exposed. & the one which forms the floor like surface of the area about the lime pits

No. 23. - - - - Chatham - - - - - - - - - - - - - 1

Taken from the N. border of old beach. Seems to illustrate a contact between lava & beach.

Can. No. 1.

Pair ~~specimen~~ sample of the lime made of the shell sand.

" No. 2.

Specimens of the sand as it is dug from the pit; 20

Box No. 6.

20 Fossil Marine shells from Fig. 1. area on Indefatigable.

Box. No. 7. 75

75 Fossil Marine shells. from Fig. 2 area on Indefatigable.

Rock Specimen Catalogue

No. 25. — Indefatigable Island — 3.

Altered beach — the matrix of fossils taken on N.E. anchorage. Fig. 1.

" 26. 2.

Specimen of matrix zone "A" Fig. 2.

" 27 2+

Illustrating matrix of zone "D" Fig. 2. With numerous crystals

" 28 1/6

Lava flow. Zone "C." Fig. 2.

" 29 1

Illustrating structure of zone "B." Fig. 2.

— Seymore Island —

" 30 1/2

Middle of terrace No. 2. Fig. 3. — portion facing middle No. 1.

" 31 1/3

E. end of terrace No. 2. Fig. 3. Accompanied by chip of glassy surfaced lava from near the same station.

" 32 1/7

Specimen of compact flow over fossil deposit in cliffs No. 5. Fig. 3.

No. 33. **James Island** 12

Large & small specimens of flow "C", Fig. 10
Recent flow - active in 1902

No. 34 1

Area "D". Flow just preceding the flow represented by the specimens of No. 33.
(Fig. 10.)

No. 35 **Jervis Island** 1

Old flow lying in loose blocks over the general surface of the middle & western high elevations. Fig. 11.

No. 36 4

Inside of old crater, indicated in Fig. 11

No. 37. 6

Chips of granitic boulder enclosed in lava flow on north elevation, Fig. 11.

No. 38. 10

Specimens taken from boulders occurring on S. side of north elevation Fig. 11.

No. 39 James 1
5

Occurring as a definite layer just between ~~above~~ the red cinder like deposits. The layer averages about 4 ft. thick. In an old crater. Few pieces of the red material.

No. 40. 1
Specimen from lava flow - to show the white deposit possibly some Cl. - thus to show that sea water furnished the exciting vapor.

Rock Specimens.

No. 41 Chatham 1+

Mass occurs as broken pieces & short layer structure in & about the upper portion of the old cone called Finger Rock. / ~~Great part of the cone is composed of this structure~~.

On the S.E. side where the rim has been broken down into precipitous cliffs the same mass appears as a flowage structure some 6 ft. thick.

No. 42 Specimens of the structure mass which composes almost the whole of the cone & former island called Finger Rock. 2

No. 43. Specimens of lava at Sappho Cove. at the terminus of ~~th~~ an old basaltic flow. Taken especially to show the grouping of the yellowish white crystals, possibly augite. 2+

No. 44. Albemarle 3.

Good specimens of the occurrence of FeS. Taken from old flow where it had been broken ~~up~~ & piled up by the flow action itself.

No. 45 Sort of schistose, thin layer rock which occurs ~~near~~ at the surface of the loose sand of the fossil deposit. 3.
Packed with the fossils.

No. 46 Small globules of a resinous organic matter which occurs in the form it is here shown at the old lava flow near the fossil deposit. Soft in hot sun. Can be partly burned. Does not seem to boil from cracks in lava, but exists loose in the form shown. 3.

Box No. 14. Marine Fossils.

Seymour. No. 1. Loose on Ground. 25

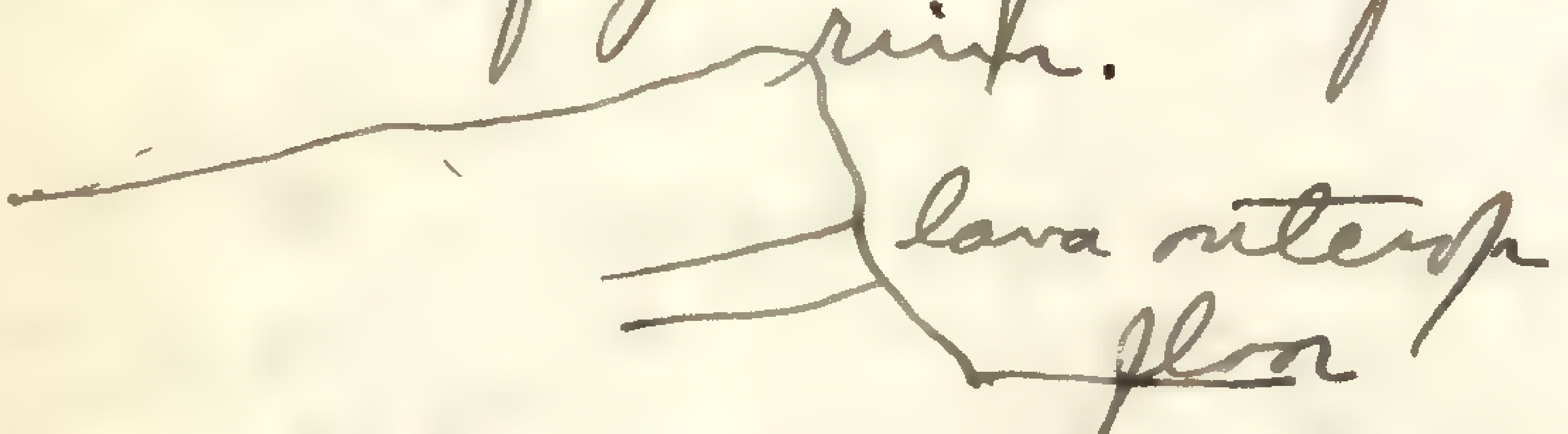
" No. 5. Fig. 3. 20

Indefatigable Zone "D." Fig. 2 3.

Albemarle. Pks. 1, 2, 3 & 4 75

No. 47 Albemarle +5

Chips of lava outcrop, taken on inner wall of 3100 ft. crater, about midway up the side figured from floor of crater.



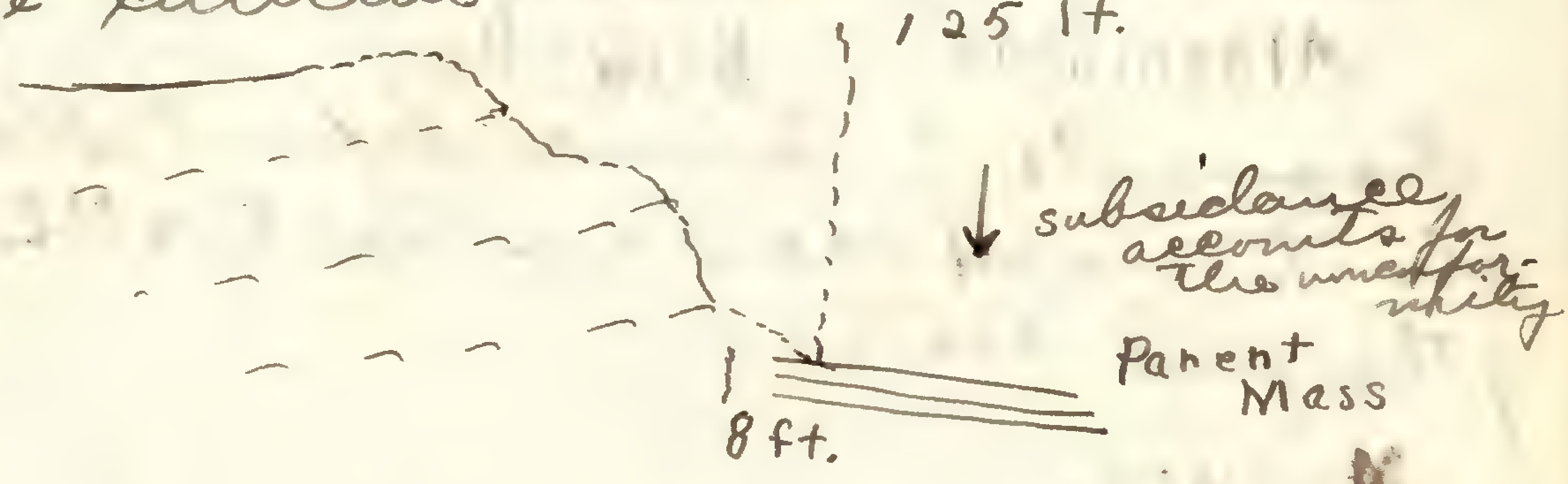
Parent mass exists as a definite layer flow about 2½-3 ft. thick & dips off at the general angle of rim floor = 15-18°

No. 48 Albemarle, Iguana Cove. 1+

Small hand specimen & chips of flow which occurs as a regular strata outcrop at the base of the sea wall side of ~~[illegible]~~ 470 ft. crater. The flow had been

Rock Specimen List.

exposed by a general subsidance & erosion on the sea face. The parent mass is a solid layer varying from 5-7 ft. in thickness ∠ of dip = 15°-18° The general extent of the flow could be traced along the shore for a number of rods where it was often broken off in large cubical blocks.



49. Albemarle. Tagus Cove. 6.

Specimens of the tufa which forms the basis of the great tufa cones & craters forming this cove, the salt lake etc. the specimens are from the part marked "6" in Fig. 22.

50 Specimen of the black sandy conglomerate stratum, marked 3-4, Fig. 22. 1

51 Specimens of the lava blocks which occur both as angular & slightly rounded fragments in the loose black stratum. The specimen illustrates the peculiar schistose fracture — possibly something as to its origin. 2

51 Chips from the same. - - - - - +

173

52 specimens of the flow which covers the territory in neighborhood of Mangrove lagoons N. of Tagus Cove. Described in notes under the head of "Mangrove Lagoons". 2

53. Small cheese-cloth bag containing specimen of beach sand which forms the beach to the N. & N.W. of Tagus Cove & fronts the Mangrove Lagoons

54 Albemarle Bank's Bay. - - - - - - 3

Fragments of Pumice deposit. The great parent mass occurs on the E. & N.E. side of the great crater.

55 Narboro. - - - - - - - - - - +

Chips of basaltic outcrop exposed on N. coast of Narboro by a breaking off of the projecting point.
Chips are from alternate flows - can be distinguished by color & texture.

S. Albemarle - Villa Mil.

30 Marine Fossils from Old Beach N. of anchorage & described in notes & located on chart.
In box with Marine Shells.

56 Charles +

Chips of lava outcrops S.W. of Spring (Tufa) Crater.

Rock Specimen List.

57 Small specimens of tufa outcrops at spring. Makes the spring possible. Photo of contact. 2

58 Illustrating the structure of the great cinder cap which forms the mt. above the tufa strata. +

59 Samples of old hardened cinders which outcrops at shore. Cormorant Bay. 2

60 Hardened beach. existing under the ~~old~~ recent dune. which forms the lagoon, Cormorant Bay. 2

61. Large crystals. & small specimen of the reddish soil which is the weathered matrix of the crystals enclosed +

62. Specimen of the basaltic sands which forms the black beach of Black Beach Road. +

63 Chips of basaltic blocks. which form the remnants of the old flows which reached the ocean at Black Beach Road. Not all specimens from the same blocks. +

Rock Specimen List.

Charles.

N.64 Large weathered out crystals and specimen of soil which formed the "crystal matrix". The soil forms the great south half of the island. It is largely grown over by the lemon groves. +

Hood

65 Hand specimen & chips taken from the flow structure exposed at the summit of the 350 ft. elevation. bearing S.W. from anchorage in Gardner Bay. Dips of flow is 27° – 32° ~~S.W~~. ↘ N.E. The parent mass is the rim of the great crater. 1+

66 Specimen of the red clay resulting from a break down of the red. vesicular lava exuded from the monticular vent on the N.E. of 350 ft point. Taken about ½ mile inland in fair almost open country. Surface of ground is strewn with loose lava pebbles & with now & then a jutting dark lava block.

Photo No1. by Mr. Beck will probably show the nature of the country very well.

67 Small sack full of the coral-sand which forms the great banks of the beach & covers the bottom of the bay.

It may be possible that by natural or artificial means the high percentage of lime (calcium carbonate) may be

177 changed to calcium nitrate, after the manner of bird excrement on coral islands to form guano.

Its properties as a natural lime for cement is shown in its uses & exportation from Chatham & Albemarle

The specimen is at least import- in illustrating a former milder condition of ocean temperature to allow of so great a coral growth.

- - - - - - - - - - - -

68 Chips taken lava blocks exposed at about 25 ft. elevation. An older flow & probably underlies the clay soil of No. 66.

69 Hand specimen of lava blocks near No. 68, but slightly lower down & seemingly another crystal structure.

Gardner

70 Chips of gray phonolytic lava blocks which forms a flow overlying a reddish layer (described under Nos. 19 etc.) & forms all of the surface flow on the island. Chips are taken from various blocks about the island.

Rock Specimen List.

Barrington

71 Chips taken quite generally from old surface eroded lava runs. +

72 Chips taken from loose lava blocks on the side & near the top of a 480 ft. elevation. Notable for the large crystals of augite & feldspar. +

73 Hand specimen which shows the general surface flow structure. Notable band of vesicular nature running through the specimen is quite characteristic of this island's flows. 1

Indefatigable.

74 Hand specimen of the great subsidence escarpment wall which bounds the inner "Academy Bay" on the S. Taken about the water line - that being some 8 ft. above the upper edge. 1

75 Chips belonging to No. 74 +

76 Large chips from exposed upper surface - or edge, of subsidence - better escarpment wall. Shows the decided vesicular nature of the surface of the flow - due to gases weathering etc: and the general merging into the hard compact: crystalline rocks deeper down.

179 Photo No. 3. of July 12 is of this wall from which these specimens were taken.

77 ---- Indefatigable ---------------- 3.

Old beach & coral lime-stone from the base of the tufa crater at "Dave Reads". The specimens are important in the discussion of evidences of subsidence & re-elevation which concerns this part of the island & Seymour.

Photo of superposed crater is taken.

78 ---- Seymour ---------------- 2

Specimens of the old beach which forms the fossil matrix. Figs. 5 & 6. Taken near the W. end, where the deposit rapidly dips into the sea.

Photo of cliffs of Figs. 5 & 6 showing the fossil beach.

79. ---- James ---------------- 1+

Taken about 200 vertical feet from the top of the ridge which runs N.W. & S.E. at an alt of 2050 ft. The parent mass is a great cliff topped by clay soil & vegetation & is exposed to a thickness of some 10'.

The tufa deposit has only a perceptible dip to the N.W.

Rock Specimen List.

80 ---- Albemarle. Cowley. Mt. -------- 3

Specimens of the great pumice deposit which covers the whole E. side of the mt. Deposit varies from 4' thick at the coast to perhaps 25' midway up the mt.

81 --- Cowley Mt. -------- +

Loose black fragments scattered about on the surface of the pumice fields.

82 -------- Duncan ---------- 1

Vesicular lava occurring in great blocks near the tip of the highest elevation, that being the eastern margin of the crater

83 ----- Duncan ----------- 1+

Hand specimen of the typical lava flows on this island. The parent mass was a large, thin, smoothly worn, phonolytic slab. Taken about half up the side, say at 450' alt. where the angle of slope is 22°.

84 Chips belonging to No. 83. +

Albemarle - Marine Fossils.

No. 18.

Bivalves, single -------	225
" double -------	10
Single specimens of good species --	10
Canthrus Jonti -------	100
Small Mitra -------	100
Turratella, large ------	20
Conus ------------	10
Small specimens in box ----	100
	575

Rock Specimens.

85 ------ Bindloe ------------ +

Chips from boulders, parts of the great flow which forms the pedistle for the island ~~and~~ (the great tufa deposit forming it.

This grayish rock runs as streaks or flows - varying from 100'-200' wide & a few feet thick, in the general black - [illegible] flow exposed at the beach.

In general appearance it is like the compact, grayish lava formation noticed in the lower part of the high cliffs of N. Tower.

86 --- Bindloe ---------- 1

Specimen of what seems a ground mass of the same composition as the chips just described with large crystals occurring as phenocrysts.

The parent mass occurs in the streaks & runs mentioned for No. 85.

87. --- Bindloe ---------- 2.

Specimen of the more abundant lava flows which underlie the great tufa deposit of the island. This type of rock is exposed on all the coastal line visited — varying in thickness from 2'-10'.

No.88 --- Abingdon ----------- 1

Hand specimen of the great mass which forms the last & extensive surface flow from the great crater. This flow extends over the whole S. side of the mt. except on the E. where a light, vesicular, dark flow of recent date overlies it. (No.90)

89. ----- Abingdon, ---------- 1

Specimen of the same parent mass as No. 88. except that it shows the surface weathering and incident alteration.

90. ---- Abingdon --------- 1

Hand specimen of the light vesicular dark colored flow which has its origin in the large monticules at an alt. of some 1500'. The flow is characteristic of a closing up activity. It is much like the flow on Bindloe which is recent & covers the tufa in places.

Photographs

1. Hood - view from 350 elevation of Gardner Bay & adjacent islands showing subsidence area.

2. Hood. - view of eastward cliffs of lava strata on N. side of 350 ft. elevation. 500 ft. elevation in the dist.

3. Barrington, - distant view of entire island - from vessel.

4. Barrington - view of lava escarpment from sandy cove. Shows the evidence of subsidence.

5. General view of surface features of Barrington - shows the broken surface & parallel subsidence ridges etc. - looking toward about W. S. W.

6. View of ~~N~~ W. end of Barrington showing the highest points & cliffs formed by the subsidence.

7. View of Barrington from N. taking the whole island and showing general structure.

8. General panoramic of the whole island of Indefatigable - in two parts. Taken from Academy Bay.

9.

9. Cliff bounding south margin of Bay. Shows how the subsidence took place & to leave an extending peninsula with a great wall on one side. Right side of photo shows the disappearance of cliff as it merges into the general surface. several hundred yards inland.

10. Tufa crater from open S. side at "Dome Road". - W. Indefatigable. Part of the evidence on subsidence.

11. Seymour. Photo of loose fossil & fossil matrix. - area "1" & "8" Fig. 8. Shows the general occurrence of the fossils at that point.

12 Seymour - Close view of the escarpment bounding the N. side of loose fossil area ("1" & "8")

13. Seymour. - View of fossil ledge Figs. 5. & 6. - taken from the deck of vessel at the anchorage.

14. Seymour. - General view of the subsidence area between the two escarpments & including them. - just opposite the vessel & taken from the vessels deck.

Photographs.

15.---Albemarle — panorama of the great crater of the Villamil Mt. — taken in three parts.

16.---Albemarle — interior view of lava tunnel. & one exterior looking into breaks entrance.

~~17.~~
17.----Albemarle. — two photos of the active solfatara.

18.----Albemarle — one view across the great crater from the S.W. looking toward Cowley Mt.

19.---Albemarle — distant view from great crater looking toward the coast.

20.---Tower. — view of old crater & lake — two parts.

21.----Tower. — view of the rim of old crater showing the absence of rim & the gentle sloping off of the lava surface.

22.----Tower — photo showing the great layer structured cliffs of the N. coast. Some 90' in height. & illustrating several quiescent periods between flows.

23. --- Albemarle - fossil deposit.

1. from lava flow looking toward the deposit & showing its island character.

2. Close view of old beach, fossil bearing deposit.

3. - surface view of old beach taking in quite an area.

24. --- Abingdon -

View of large, tide water level, lava tunnel. Taken at a point where the roof has caved in.

25. --- Abingdon ---

View looking east from lava tunnel, taking in the phenocrystine basalt, the beach. The recent dark flow (No. 90), and the tufa-ash cone in the background.

Photographs, Geologic.

1. San Benito. 1.
2. Cocos - possibly 2 or 3 general views.
3. Hood. " " " " "
4. Indefatigable. ~~1~~4 - of the fossil deposits.
5. Seymour 1 gen. 5. fossil deposits.
6. Duncan. 2 - interior of N. & S. craters.
7. James. 4, lava flow & dist. crater.
8. Jervis. view from James.
9. Chatham. two coastal views in & at Sappho Cove. one distant view of the important Finger Rocks.
10. Old Crater Cove. S.E. of Tagus Cove. panoramic 2 parts.
11. Greater crater 4000 ft. alt. back of Tagus Cove. 2 parts to panoramic.
12. View of coastal cliffs near Watering Place subject of fig. 22.
13. View of Watering Place strata & above.
14. " " Banks Bay Crater
15. General view of Narborough from N. shore.
16. View of 1780 ft. crater from S. Charles
17. " " from Spring Mt. looking N.E. "
18. Showing the "breaking off" tendency of N.W. pt. of Spring Mt.
19. View of Spring.
20. Showing contact of tufa & cinder at spring.

Waln Place Ave.

Sep. 25
Hood
C 22 22
22 22 1/2
22½ 23 1/2
~~28~~ ~~22~~ 1/2
30 22 22 1/2
B.B. Charles
Oct. 6. 69 69
7. 68 67
8. 67 70
10 70 70
11 " "
13 69.5 71
Chatham
16 67.5 70
17 66. 71
18 66.5 70
Barrington
21 70 70
23 " "
24 " "
Academy
Nov. 10. 73 73
11 73.5 67
13 71.5 72
14 72. 71
16 72 71
17 72.5 72
Seymour
Nov. 22 72.5 72
23 73.5 74
25 73.5 71.5

Nov. 27. 75.5 74
28. 75 74.5
29. 74 71
Duncan
Dec. 3. 69 73
4 70 70
5 70.5 70
6 71.5 71
13 72.5 73
14 72. 72
15 " "
James B.
22 73 71
23 72½ 72
28 70 71
Academy
Jan. 15, 76 75.5
Hood
Feb. 2. 75.5 76.
Sapplee Co.
Feb. 2. 76 77

220
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75
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20
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75
575

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